RUBBER WORLD

JUNE, 1948

SRF* carbon black

LOWER COMPOUNDING COSTS

HIGH LOADINGS

Semi-Reinforcing I

LOW PRICE



AVAILABILITY

GODFREY L. CABOT, INC.

77 FRANKLIN STREET, BOSTON 10, MASS.

An Economical, Efficient Blowing Agent

Du Pont [] [

- Produces small, uniform cell structure
- Completely non-discoloring
- Disperses readily and uniformly in all elastomers

NICEL S, a dispersion of finely divided sodium bicarbonate in oil, combines all the advantages of elastomer-soluble organic blowing agents with those of ordinary soda. Because of its fine particle size, it decomposes rapidly at curing temperatures in the presence of stearic acid, and thus only small amounts are needed. This improved efficiency also permits the use of smaller amounts of stearic acid than are required with ordinary soda. Unicel S decomposes so completely during cure that there is little or no residue of sodium carbonate in the sponge.

We'll gladly send you a sample of Unicel S so you can see for yourself the advantages of this improved blowing agent. Our new bulletin, Report 48-2, contains complete information on its use. Write us if you need extra copies. Rubber Chemicals Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

Sponge blown with Unicel S. (Magnified 8 x.)

Tune in to Du Pont "Cavalcade of America." Monday Nights - NBC Coast to Coast

DU PONT RUBBER CHEMICALS E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

PROPERTIES OF UNICELS -

Composition: A stable, 50% dispersion of finely divided sodium bicarbonate in oil

Specific Gravity: 1.27.

Appearance: A cream colored, free flowing

Odor: Practically none.

Storage Stability: Good.

Stability at Processing Temperatures: Good.

Effect on Rate of Cure: Very slight activation

Health Hazards: None, when used as directed.

Amount to use: 1-4%, based on the elastomer, will be satisfactory for most applications.

PUBLIC LIBRARY TWO NEW PLAS

New Hycar Nitrile Polymers make processing easier and widen fields for makers of many products

HIS news is important to any company deal-I ing in any way with the vinyl resins. The new Hycar EP (easy processing) and Hycar NS (easy-processing, non-staining) offer exceptional advantages. These are nitrile rubbers that really blend with the vinyls. Check these properties:

- * PERMANENT CEMENTABILITY—because these plasticizers are nonmigrating and non-volatile. (Of vital interest to any manufacturer of products requiring cemented construction.)
- * STABILITY won't get brittle, won't evaporate.
- * NON-MIGRATING-won't soften or pick up varnish.
- * EASY PROCESSING—and a more perfect blend either on a mill or in a Banbury. Calenders and extrudes smoothly.
- * HIGHER LOADING— economy in products where the price per pound of the compound is important.
- * WIDER LATITUDE—in color and color stability, particularly with those hard-to-do pastels.

Our service balletin, 48-H1, on the use of the new Hycar American Rubber with the vinyl resins, will be sent on request. We make no finished products from Hycar or any of our other raw materials, but we are glad to help in the development work on any special applications. Write Dept. HA-6, B. F. Goodrich Chemical Company. Rose Building, Cleveland 15, Ohio.



B. F. Goodrich Chemical Company THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals



SPLICES WELL!

And they lived happily ever after!

But that's only the happy ending of the story about the joining of rubber with Philblack A. All during the life of the product, Philblack A continues to give excellent resistance to abrasion and to cut and crack growth. And he has other good qualities! Philblack A provides high hot tensile . . . good heat and electrical conductivity . . . and superior resilience.

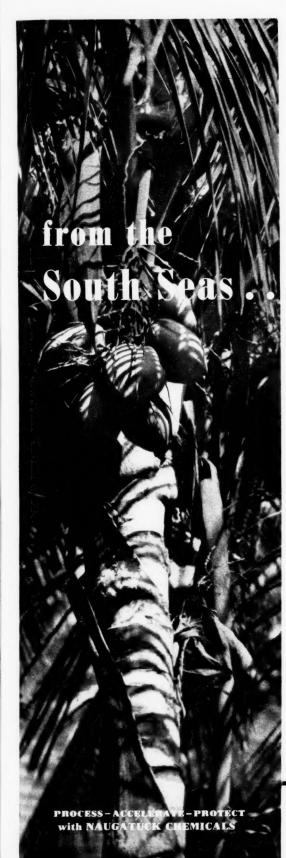
Try Philblack A in your rubber products and see how this HMF type black cuts processing time . . . helps in obtaining smooth extrusions . . . and removes the nerve from rubber. Yes, we think you're going to love Philblack A!

PHILLIPS PETROLEUM COMPANY

Rubber Chemicals Division



EVANS SAVINGS AND LOAN BUILDING . AKRON 8, OHIO



. to New England

from
Coconut Palms
to LAUREX

The most efficient fatty acid activator

— plasticizer for your rubber stocks

LAUREX

Produced from Coconut Oil by NAUGATUCK, offers these advantages in natural rubber compounding.

- LAUREX is a stronger activator of thiazoles in natural rubber than other fatty acids; hence less is required.
- 2 LAUREX is an excellent plasticizer for use with natural rubber.
- 3 LAUREX supplies the soluble fatty acid necessary for developing optimum physical properties with off-grade natural rubbers.
- 4 LAUREX has high solubility in natural rubber, reducing the tendency for bloom.

Write for new bulletin on LAUREX in Natural Rubber

NAUGATUCK

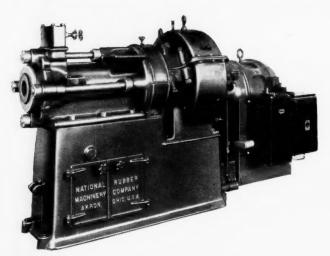


CHEMICAL

Division of United States Rubber Company

1230 AVENUE OF THE AMERICAS . NEW YORK 20. N. Y

IN CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ont.



REASONS WHY your new National Tuber can CUT PRODUCTION COSTS!

National Heavy Duty Tubing Machines are designed to solve your particular problems of production promptly.

Their performance, in terms of increased production, is another step forward in rubber processing techniques which advanced engineering makes possible.

National Heavy Duty Tubers are available in 8 different sizes ranging from 2" to 12" screw diameters, and smaller sizes for laboratory work.

Complete descriptive literature on NRM Tubing Equipment will be mailed upon request.



- 2. PYRO-HARDENED SCREWS of selected forged steel insures maximum durability, minimum wear. Screw is held in perfect alignment in cylinder through use of rear extension thus reducing wear on screw and cylinder bushing.
- 3. HEAVY CAST IRON CYLINDERS, water jacketed, with removable spiral sleeve equipped with hardened steel or Xaloy bushing.
- 4. HOPPERS, conveniently designed for manual or mechanical feeding.
- 5. MANIFOLDS are built in and equipped with four valves for heating or cooling cylinder as required.
- 6. STRESS RODS are extra heavy to insure perfect alignment of head and cylinder with gear housing. Precludes breakage.
- 7. AIR GAP opening between feed box end of cylinder and gear housing prevents heat transfer from cylinder and provides inspection of oil packing gland.
- 8. THRUST BEARINGS are anti-friction type and oversize throughout for added strength.
- **9.** DRIVE GEAR UNITS employ case hardened steel herringbone gears. All shafts mounted in heavy duty roller bearings. Sealed, oil tight housing joints . . . self-lubricating system eliminated force feeding. Flexible coupling.
- 10. BASE PLATES are of heavy cast iron and provided with doors for tool storage.



NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON 8, OHIO

California Representative: Sam Kipp, P. O. Box 441, Pasadena 18, Calif.

Creative Engineering



For technical data please write Dept. CA-6

B. F. Goodrich Chemical Company THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO



The Governor of Utah invites You



STATE OF UTAH SALT LAKE CITY

HERBERT B. MAW

The State of Utah takes pleasure in present-To American Industry:

ing to American Industry an opportunity for new development and expansions.

The State of Utah prides itself on the quality of its people, the tremendous extent and ready availability of its raw materials, its unlimited power resources, its unequaled transportation facilities, and its friendly attitude toward business.

These factors, together with the advantages of living under ideal home surroundings in the nation's most interesting area, has already induced many fine industries to

A new industrial economy is developing in our locate in our State. commonwealth based on the substantial foundations of the basic commonweath based on the substantial foundations of the basic materials available and the happy and contented people consti-

The establishment of your business in Utah tuting the human resources. will give you an opportunity to share in this new industrial

will give you an opportunity to snare in this new inquistrial economy and to participate in the growth already experienced in the west.

Jour BMa Governor



Herbert B. Maw

* One of a series of advertisements based on industrial opportunities in the states servea by Union Pacific Railroad.

Unite with Union Pacific in selecting sites and seeking new markets in California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.

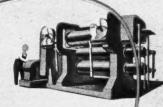
> *Address Industrial Department, Union Pacific Railroad Omaha 2, Nebraska

UNION PACIFIC RAILROAD

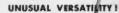
Road of the Daily Streamliners

MODERN PLANT!

New Marvinol plant, now in production, contains latest equipment to assure efficient operation, uniform product No division of The Glenn L. Martin Company compounds or fabricates in the plastics field.



Products made from Marvinol resins show less heat deformation than other resins . . . offer positive advantages in low temperature flexibility.



Easy to process, Marvinol resin may be calendered, extruded, injection molded, used in non-aqueous dispersions, ormulated as unplasticized ripids.

these unique advantages make MARVINOL® RESINS a must!

TECHNICAL COOPERATION

Expert sales engineers and fully-equipped customer service laboratory are available. Write on your company letterhead to Chemicals Division, The Glenn L. Martin Co., Baltimore 3, Maryland.



UNSURPASSED STABILITY!

A polyvinyl chloride-type resin, of high molecular weight, Marynol offers superior resistance to hear, light and other normally destructive factors.



MANY OTHER ADVANTAGES!

Unusual "drymess" . . . exceptional toughness and long life . . . may be tasteless, odorless . . . early, quickly cleaned . . can give crystal-clear transparence brilliant or delicate colors.



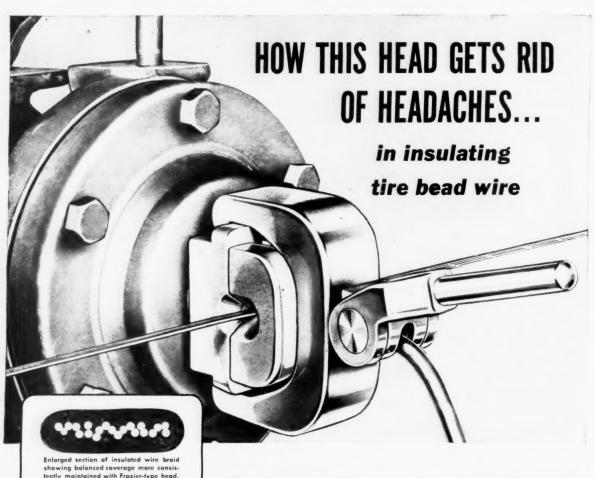
A leader in research, Martin introduced the first plastic nose section for aircraft in 1921 ... developed the first leak-proof flexible fuel tank, the Mareng cell . . . used as many as 400 plastic parts in one plane.



RESINS, PLASTICIZERS AND STABILIZERS PRODUCED BY THE CHEMICALS DIVISION OF

THE GLENN L. MARTIN COMPANY . AN INTERNATIONAL INSTITUTION

"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"

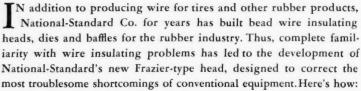


MANAGES S

Typical off-balance due to stock surge which forces wire to one side of die. Thin rubber film is easily broken or removed in subsequent operations.



Excessive coverage at one edge, a result of uneven die wear caused mainly by stock surge, results in unbalanced bead.



- 1. The new-type head divides the stock, sandwiches the wires, lessens surge, and allows the wires to pass through the die and baffle with the least amount of disturbance.
- 2. As a result there is better control and more uniform coverage, relieving the possibility of separation due to wire exposure.
- 3. In turn, better coverage and relief of surge reduces wear on die and baffle. Thus die life is often doubled.

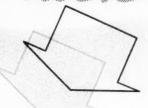
The new Frazier-type head offers still other advantages. These, together with details of construction, application, available dies and baffles, etc., are shown and described in a new catalog. A copy is yours for the asking. *National-Standard Company, Niles, Michigan.*



DIVISIONS OF NATIONAL-STANDARD CO.

ATHENIA STEEL Clifton, N. J	ng Steel
NATIONAL-STANDARDNiles, MichTire Wire, Fabricated Braids an	d Tape
WAGNER LITHO MACHINERY Jersey City, N. J Lithographing and Special Ma	chinery
WORGESTER WIRE WORKSWorcester, MassRound Steel Wire, Sma	II Sizes







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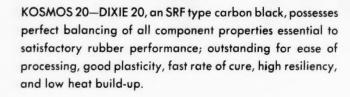
Plainly and distinctively colored designations make United bags for each type of carbon black easy to identify . . , another advantage in using United Blacks.

UNITED CARBON COMPANY, INC.

NEW YORK . AKRON . CHARLESTON 27, W. VA. . CHICAGO . BOSTON









DIXIE 40—KOSMOS 40, an HMF type carbon black with these properties—cool mixing, smooth and rapid extrusion, fast rate of cure, high resistance to cut-growth, flex cracking and abrasion. Produced by a special process this furnace type black is especially useful for tires, tubes, footwear, and mechanical goods.



KOSMOS 50—DIXIE 50, an HMF type black, made by a new United process, in specially designed furnaces from carefully selected fuel. Featured by ease of mixing, ready dispersion, fast extrusion, low shrinkage and fine appearance of stock, also a quick curing black, yielding high modulus and tensile.

DIXIE 60—KOSMOS 60, an RF type black, new, different, and better. A fast curing black requiring low acceleration, it has been acclaimed for faster and smoother processing, high extrusion efficiency, less rejects at tuber, low shrinkage, glossy smoothness, dense appearance, freedom from ragged edges and for outstanding reinforcement for resistance to tread wear.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia





OF PLIOLITE S-6

Specific Volume Resistivity, ohm-cm x 1016 = 35 Specific Surface Resistivity, ohm x 1016 = 6

Dielectric Constant	1,000 cycles	1,000,000 cycles	60,000,000 cycles
	2.52	2.60	2.5
Power Factor, %	0.045	0.051	0.9

THE above chart shows the excellent electrical properties of PLIOLITE S-6. It helps explain why this unique reinforcement is so well suited to use in wire insulation and other products where electrical resistance is required.

PLIOLITE S-6 offers these other important advantages in electrical insulation stocks:

It reinforces GR-S and Buna N,

increasing tensile, elongation, hardness, stiffness, tear resistance and flex-life.

It stiffens and hardens natural rubber.

It improves the oven-aging of natural rubber.

At elevated temperatures it acts as a plasticizer for synthetic and natural rubber to improve processability and reduce shrinkage.

It can be mixed directly in the Banbury.

PLIOLITE 5-6 is available as a powder for your own mixing, or in master batches in whatever rubber you select. For complete information and sample, write: Goodyear, Chemical Products Division, Plastics and Coatings Dept.. Akron 16, Ohio.

Plielite-T.M. The Goodyear Tire & Robber Company

GOODFYEAR



HOSE LEAD ENCASING PRESSES



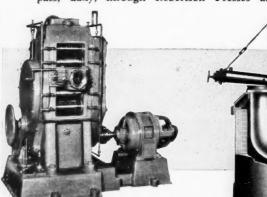
SERTSON

We believe that more Garden Hose is lead encased on Robertson Hose Lead Encasing Presses than any other make of equipment in the world.

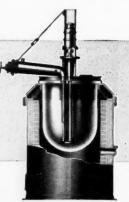
assure maximum quality production with minimum maintenance and operating costs. That's why — in the leading plants of the Industry — miles and miles of UNCURED RUBBER HOSE pass, daily, through Robertson Presses and

come out properly sheathed - ready for vul-

Operating and performance data on all Robertson Equipment will be mailed on request.



Lead Sheath Stripping Machine



Open Lead Melting Pot



13] WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

these NATURAL RUBBER RECLAIMS

are still freely available!

Buffalo GRAY CARCASS

4506—for calendering, tubing and molding 4536—high rubber content

4537—for doughs and cements



Substantial quantities await your compounding needs. Both types of reclaim will save milling time and accelerator. You get such working qualities as body, consistency and aging properties. And remember . . . prices for natural rubber may rise even higher, so it's worth while to use these lower cost replacements today. Write for samples.

REOPRENE RECLAIMS



U. S. RUBBER RECLAIMING CO., INC.

500 Fifth Ave., New York 18, N. Y. (Plant at Buffalo, N.Y.)

TRENTON . . . H. M. Royal, Inc., 689 Pennington Ave.

66 Years Serving the Industry Solely as Reclaimers

available in several



RO

"CUSTOM-PRODUCED" FOR SPECIFIC JOBS

n supplying the needs of the rubber industry for the past century, Farrel-Bir-mingham has learned the precise requirements of each type of rubber processing roll . . . the exact qualities each roll needs to best do its job ind stand up under the punishment it will receive.

The application of this experience in roll manufacture in a plant where exceptional facilities have been developed, and where only the highest grade materials are used, adds up to the reason for the built-in competence and extra service life that rubber manufacturers have come to expect from F-B rolls.

Production procedures that safeguard F-B roll quality include: correct design by experienced engineers ... close control throughout each step of manufacture, from metallurgical analysis of raw materials and prescription of the metal mixture, to final inspection of the finished roll . . . a method of casting chilled iron rolls which assures a hard working surface of correct and even depth and preserves the strength of the gray iron structure of the roll body .. careful machining by the most advanced methods . . . grinding bodies and journals to required accuracy and finish, with straight, crowned or concave face.

When you need rolls or other rubber processing equipment for specific applications, call on Farrel-Birmingham.

FARREL-BIRMINGHAM CO., Inc. ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa,

Refiners Calenders Mills Washers and Crackers Farrel-Birmingham

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PROTOX-166 Provides

Better Incorporation and Dispersion Characteristics in Both Synthetic and Natural Rubber

First introduced in 1941 as XX-166, Protox-166 is the propionic acid treated† Zinc Oxide which was developed especially to provide better incorporation and dispersion characteristics in both synthetic and natural rubber.

Protox-166 bulks less than other Zinc Oxides. This increase in apparent density permits mixing of larger master batches in the Banbury Mixer and on the roll mill. Protox-166 mixes more rapidly, and the quality of the dispersion obtained is very much better.

This ease of mixing means measurably lower power consumption and lower mixing costs.

†U. S. Patents 2,303,329 and 2,303,330

Characteristics and Properties of PROTOX-166

- 1. Bulks about two-thirds of the volume of XX-4
- Improves processing (incorporates more rapidly with better dispersion)
- 3. Permits larger master batches
- 4. "Slow-Curing" (practically the same rate as XX-4, with an indication of a greater lag in early cures; inhibits scorching)
- Lowest moisture pick-up of all brands of Zinc Oxide
- **6.** Gives good modulus, tensile, tear resistance, and heat build-up properties
- Lowers power consumption and costs

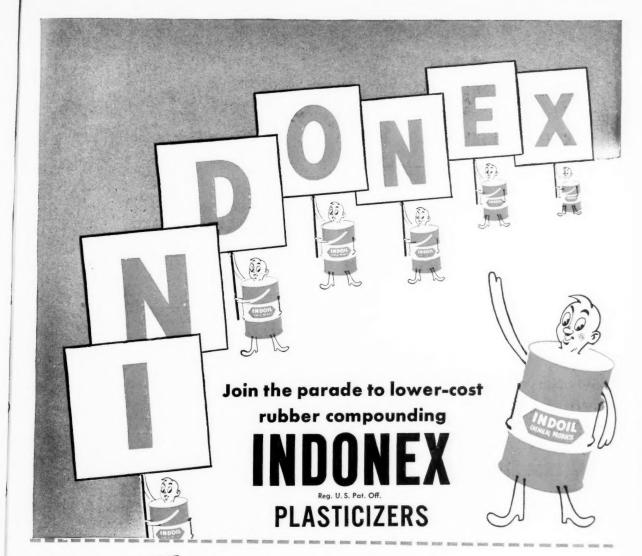


THE NEW JERSEY ZINC COMPANY

160 FRONT STREET . NEW YORK 7, N. Y.

Products Distributed by THE NEW JERSEY ZINC SALES COMPANY

NEW YORK . CHICAGO . BOSTON . CLEVELAND . SAN FRANCISCO . LOS ANGELES



Send for any of these Bulletins General results obtainable with INDONEX in natural and synthetic rubbers have been described in our Bulletin No. 13, while various other specific applications of INDONEX are discussed in the following circulars. Check the circulars you want, clip the list to your letterhead, and mail.

☐ 13-1—Butyl Rubber Compounds ☐ 13-2—Butadiene-Acrylonitrile Copolymer Compounds
☐ 13-3 — Neoprene Compounds ☐ 13-4 — Tire Carcass Compounds ☐ 13-5 — Footwear and Heel Compounds
□ 13-6—Camel Back □ 13-7—Motor Mount and Bumper Compounds □ 13-8—Wire Jacket and other Extruded Com
pounds 🗌 13-9 — GR-5 Packing Compounds 🗎 13-10 — Hose Compounds 🗀 13-11 — Hard Rubber Compounds
☐ 13-12—Low Hardness Mechanical Goods ☐ 13-13—Neoprene Mechanical Goods ☐ 13-14—Hycar OR-15
☐ 13-15—Natural Rubber—Reclaim Mechanical Goods and Carcass Compounds ☐ 13-16—Hard Rubber Com-
pounds 🗆 13-18—Masterbatch Addition to Natural Rubber Compounds 🗆 13-19—Various Fillers in
Reclaim Stocks 13-20—Selection of INDONEX-Accelerator Combinations.



STANDARD OIL COMPANY (INDIANA)

Chemical Products Department

910 South Michigan Avenue

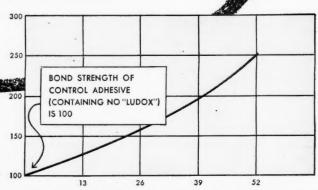
Chicago 80, Illinois

DU PONT

Colloidal Silica

...increases bond strength of latex adhesives

Also increases modulus and wear resistance of latex films and coatings



APPROXIMATE PARTS OF "LUDOX" PER 100 PARTS OF DRY ADHESIVE

CHART SHOWS STRENGTH increase obtained in leather to leather adhesion using a commercial, natural rubber latex adhesive, containing "Ludox."

NEW DU PONT "LUDOX" now offers a means of increasing the bonding strength and versatility of your latex adhesives.

"LUDOX" STRENGTHENS—as much as two to three times—latex adhesion to a wide variety of surfaces . . . including fabric to fabric, leather to leather, and latex to metal. And, in many instances, it gives superior bonds where there is no adhesion with silica-free latex compositions.

Improves Latex Films and Coatings

"LUDOX" improves wearing qualities by decreasing abrasion up to 50%. It also reduces water absorption and swelling of neoprene and it gives outstanding increases in the modulus of neoprene-dipped goods.

New 30% Concentration Now Available

"LUDOX" is now available as a 30% aqueous, colloidal

solution . . . highly fluid and substantially free of alkali.

"LUDOX" contains silica high in purity . . . chemically reactive and finely subdivided. The particle size is less than 1/1,000,000 of an inch.

Technical Assistance

For further information on how "Ludox" can help you make better latex products, write or wire Du Pont today. A Du Pont technical representative will be glad to discuss with you the application of this new development to your own products.



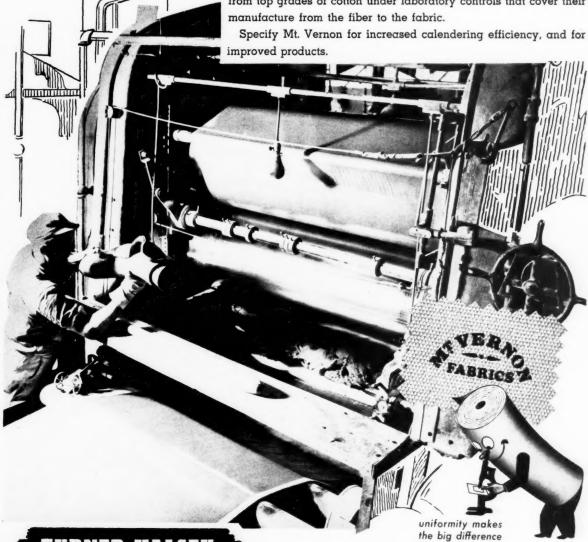
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington 98, Delaware

Put Mt. Vernon On <u>Your</u> Calendar For Better Calendering

The smooth, continuous operation of your calendering machines depends to a large extent on the quality of the fabric you use.

That's why purchasers of calendering fabrics prefer Mt. Vernon. They know its high degree of fabric uniformity means better, smoother calendering—superior products. Mt. Vernon fabrics are produced from top grades of cotton under laboratory controls that cover their manufacture from the fiber to the fabric.



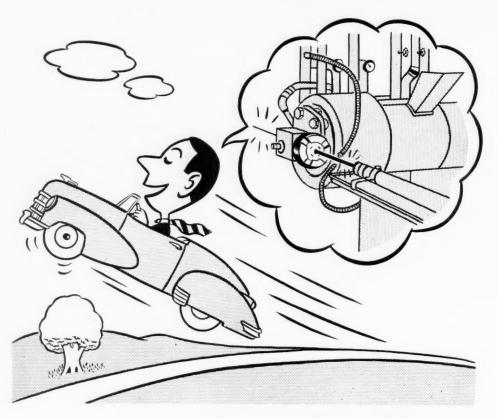
TURNER HALSEY

Selling (th) Agents

Mt. Vernon-Woodberry Mills

Branch Offices: CHICAGO . ATLANTA . BALTIMORE . BOSTON . LOS ANGELES . AKRON

June 1948



"Golly, she runs as smooth as our extruder runs when we're using Calumet in our compounds."

PEQUANOC CALUMET

—is a neutral GRS tire reclaim that is being successfully used in THIN-WALL CODE-WIRE INSULATION.

Formulations containing Calumet are meeting all specifications.

Calumet is readily available

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

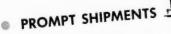
MAIN OFFICE and FACTORY

HAROLD P. FULLER 203 Park Square Bldg. Back Bay, Boston, Mass. BURNETT & CO. 225 Lafayette St. New York 12, N. Y. **BUTLER, NEW JERSEY**

W. T. MALONE, Jr. General Supply & Chemical Co. 28 Woolverton Avenue Trenton 7, N. J.

uniform LIGHT-COLORED LIGHT-COLORED LUMINOUN LUMI

For an extra fine, hard, rubber-compounding clay CHAMPION is the name . . . Special care in the mining and the processing of this clay by the National Kaolin Company, at Aiken, South Carolina, assures utmost uniformity in color . . . Uniform drying by automatically controlled oil heat prevents calcining and subsequent discoloration . . . Expanded facilities now make possible fast service on practically unlimited volume requirements.





CAREFULLY PACKED in bags of uniform weight and loaded in specially prepared, lined cars to minimize breakage.





HARWICK STANDARD CHEMICAL CO.

BRANCHES: BOSTON, TRENTON, CHICAGO, LOS ANGELES

LD



ith the long strides of Rubber ST. JOE IS RIGHT IN STEP

The rubber industry is constantly alert to the improvement of its products. Research and development facilities of the industry are currently being expanded, and it is generally predicted that many new products will soon appear on the market. Naturally, this will require additional quantities of raw materials.

In step with the long strides of the rubber industry, the St. Joseph Lead Company is now enlarging the production capacity of its Josephtown, Paplant, where ST. JOE Lead-Free ZINC OXIDES are produced by a patented

Electro-Thermic process. Additional tonnages of our American Process Zinc Oxides will thus become available, and the already established high quality of our Black Label, Red Label and Green Label Zinc Oxides will continue to be of service to the rubber industry.

ST. JOSEPH LEAD COMPANY

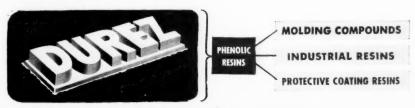
250 PARK AVENUE • NEW YORK 17 • ELDORADO 5-3200
Plant & Laboratory: Josephtown, Beaver County, Pennsylvania



THESE EVINRUDE Sportwin motor control knobs and handles suggest why rubber manufacturers use Durez phenolic resins for hard and semi-hard stocks. For your ease in ticking them off, we've listed all the advantages at the right. Many of them can lead to improved production techniques in your plant. Many of them help to make products sell easier and serve better. Rubber manufacturers are invited to send for free samples and the study, "Durez Resins in the Rubber Industry." Write to Durez Plastics and Chemicals, Inc., 306 Walck Road, North Tonawanda, N. Y.

12-WAY IMPROVEMENT FROM ONE INGREDIENT

- Improve mixing...by plasticizing and reducing nerve.
- Carry extra loading...by its fluidity when hot.
- Improve molding...by becoming plastic and then hardening.
- Reduce vulcanizing time...by its fast cure and vulcanizing effect.
- Increase hardness...by setting hard in itself.
- Increase stiffness...by its natural cured rigidity.
- Reinforce...by increasing tensile strength.
- Improve wear...by improving abrasion resistance.
- Resist higher temperatures...by its natural heat resistance.
- Improve chemical resistance...by its inherent solvent and chemical resistance.
- Produce glossy finish...by its natural high gloss.
- Improve weather resistance...by its resistance to water and oxidation.



PHENOLIC RESINS THAT FIT THE JOB

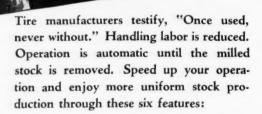
BIG ADVANTAGES..

make this attachment Indispensable!

..the

Akron-Standard

STOCK BLENDER



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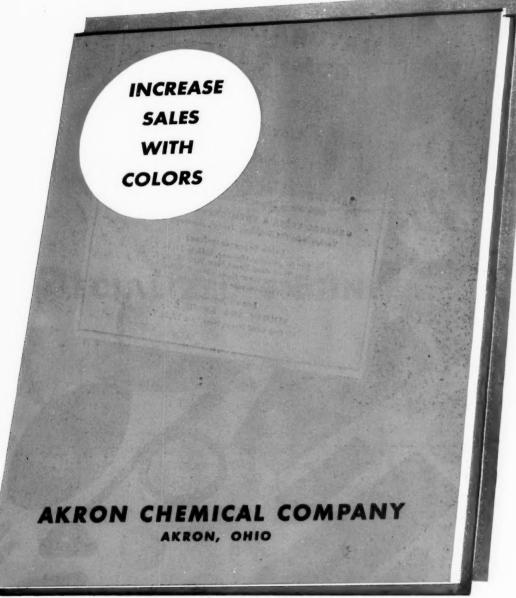
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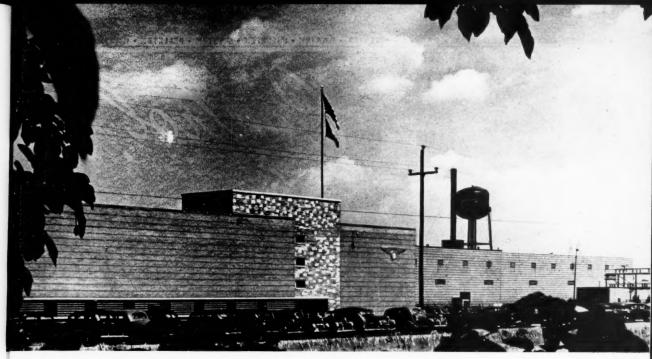
Akron 4, Ohio

June, 1948

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New Minnesota Mining and Mfg. Co. adhesives plant at Bristol, Pa., being installed in buildings designed by Giffels and Vallet, Inc.

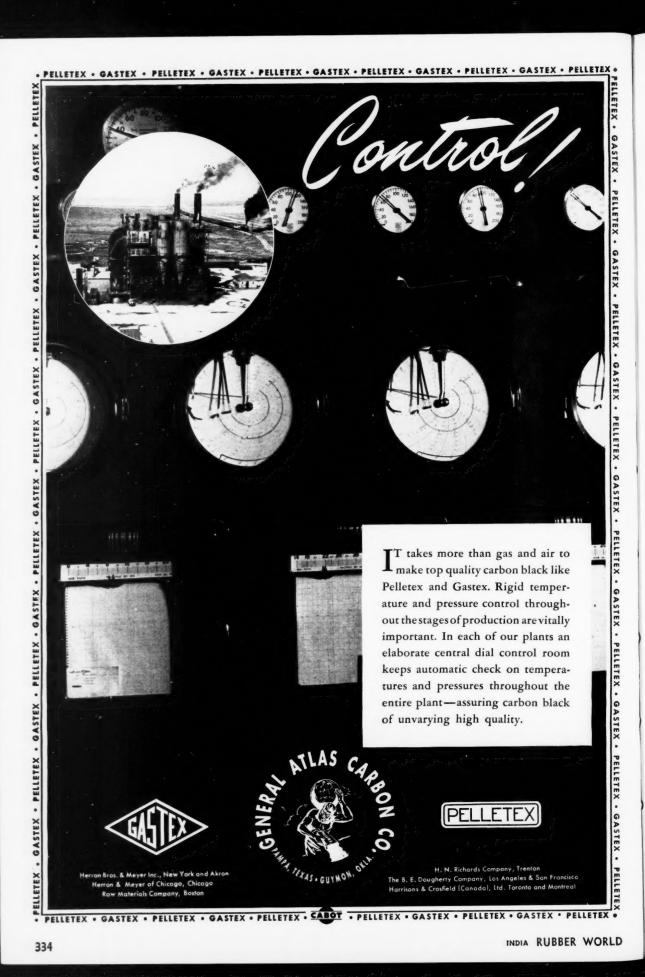
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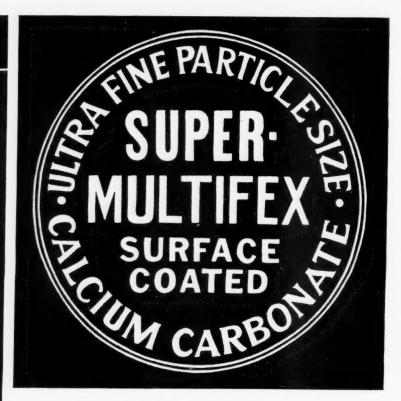
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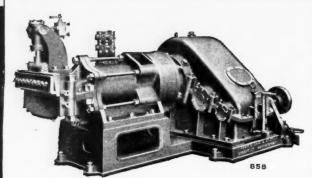
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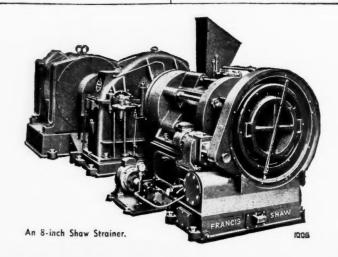
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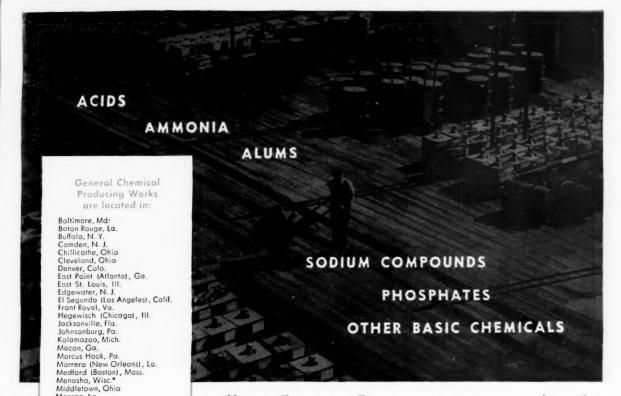
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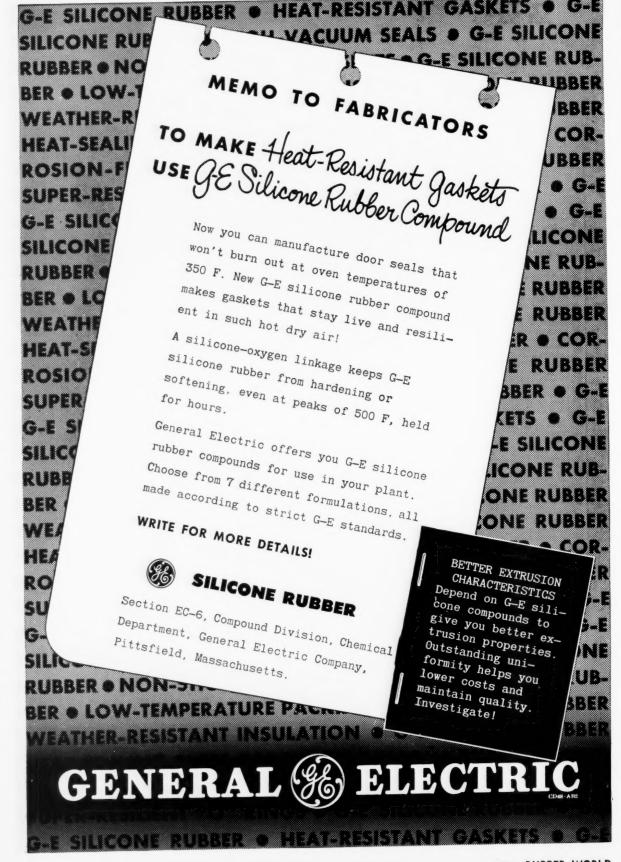
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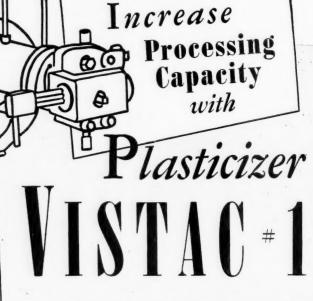
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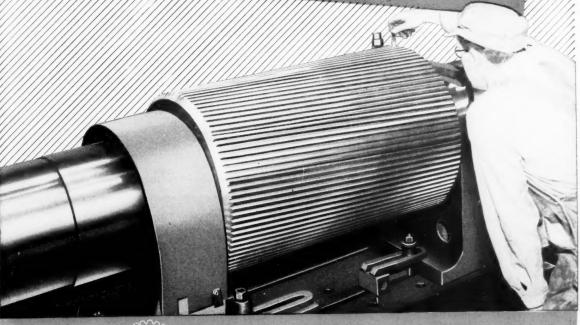
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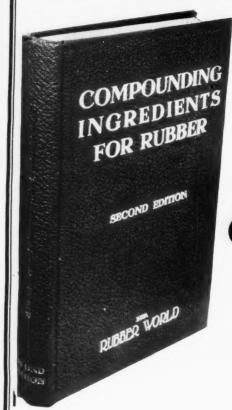
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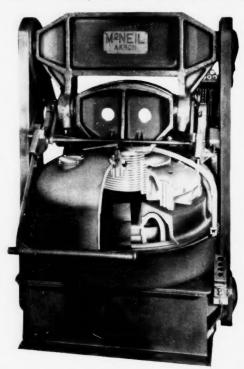
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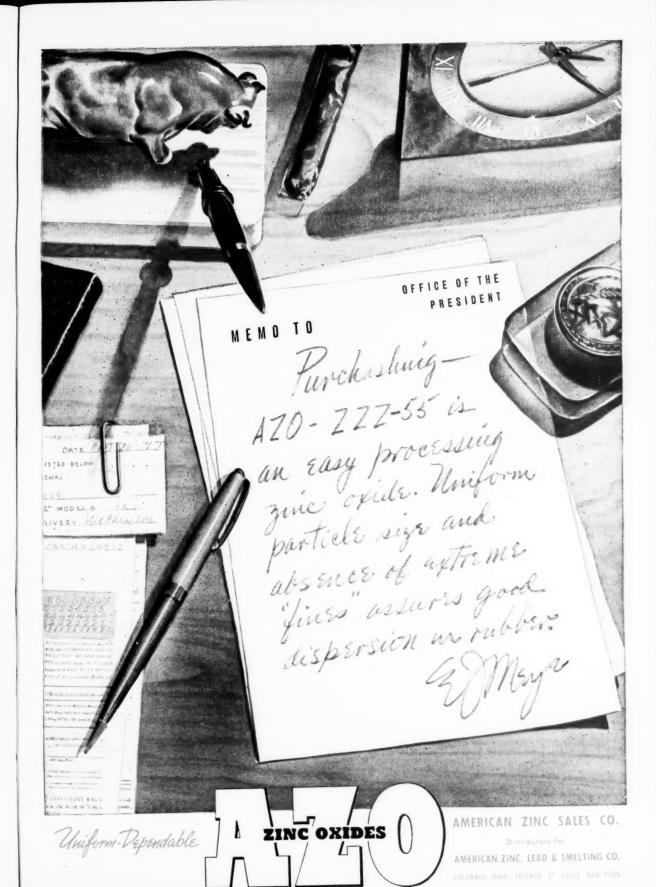
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June, 1948

353

SUBJECT: REPLACEMENT OF WYEX (EPC) BY MODULEX (HMF) IN NATURAL RUBBER TREAD TYPE COMPOUND

Effect on physical properties of Wyex tread stock in which 10%, 20%, 30%, and 40% of the Wyex has been replaced by Modulex (HMF) black.

0	01	AD	OI	TAT	DS
	UI	VIT	UΙ	JIN	UD

OOMI OOMD					
	A	B	C	D	E
Smoked Sheets	100	100	100	100	100
WYEX (EPC)	50	45	40	35 .	30
MODULEX (HMF)	-	5	10	15	20
Zinc Oxide	5	5	5	5	5
Sulfur	2.75	2.75	2.75	2.75	2.75
Mercaptobenzothiazole	.875	.825	.775	.725	.675
Stearic Acid	4.	4.	4.	4.	4.
Pine Tar	2.5	2.5	2.5	2.5	2.5
Antioxidant	1.5	1.5	1.5	1.5	1.5

PHYSICAL DATA

Abrasion Resistance (% Comparison)	100	94.4	93.9	91.4	86.6
Heat Generation	384	348	346	314	308
Tensile	4000	3915	3800	3750	3705
Elongation	580	580	597	600	603
Modulus @ 400%	2120	2220	2140	2100	2080
Rebound	67.4	68.0	68.2	70.6	71.4

SUMMARY

- 1. Resistance to abrasion is reduced progressively from 5.6% to 13.4%.
- 2. Heat generation is materially reduced.
- 3. Ultimate tensile is progressively reduced from 2% to 8%.
- 4. Modulus remains constant and elongation increases slightly.
- 5. Rebound increases progressively from 1 to 4 points.



INDIA

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RUBBER WORLD

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Number 3

D. F. Fraser²

Injection Molding of Rubber Goods 1

THIS article on the injection molding of rubber goods was part of a recent technical session of the Akron Rubber Group. A panel discussion, in which Mr. Fraser was assisted by several other experts in the field, followed the presentation of the paper and is recorded at the end of this article. Editor.

POR the past four years the injection molding of rubber goods has been of great interest to the rubber industry. The original equipment was developed and patented by Walter P. Cousino. The basic patent, No. 2,402,805 (United States), applied for on January 8, 1943, was issued to Chrysler Corp. as assignee on June 25, 1946. During 1943, Monroe Auto Equipment Co. and Hydraulic Press Mfg. Co. were licensed by Chrysler Corp. to develop further and market the necessary equipment for injection molding.

In order to complete the development and at the same time prove the worth of the developments in production, Monroe Auto Equipment Co. set up at Hillsdale, Mich., a battery of seven hydraulic presses each equipped with an injection head. These machines are operated around the clock in production so that each new development is tested under actual production conditions. Numerous problems, which might not have been revealed under laboratory conditions, have been encountered, and the solution of these problems has had a decided influence on the current status of design. By operating a number of machines simultaneously faster progress has been made than would be possible with only one or two machines.

Injection Head Design

RLD

Fundamentally the present injection head consists of a two-inch-diameter extruder, the screw of which closely fits the housing or barrel. The injector head is equipped with suitable thrust bearings and reducing gears driven by a multi-speed A.C. motor or, preferably, by a variable speed D.C. motor. One fundamental difference from conventional extruders lies in the use of two "baffle" gears mounted a short distance below the feed box in mesh with and on directly opposite sides of the screw. These gears are free to rotate as the screw is rotated and serve as a mechanical pressure lock, but do not appreciably interfere with the volume delivery of the screw. The use of the baffle gears permits the gen-

Presented before the Akron Rubber Group, Akron, O., Feb. 6, 1948.
 Manager, rubber division, Monroe Auto Equipment Co., Hillsdale, Mich.

eration of sufficient pressure to force the rubber through the relatively small runners and gates of the mold into the mold cavities.

At the beginning of a cycle the injector head is moved to the closed mold so that the nozzle seats in the female sprue of the mold; the injection head is held in place by suitable hydraulic cylinders. Before the actual injection is started the end of the screw is seated against the nozzle retainer. As the screw rotates, it is forced away from this seat, allowing a passage for the rubber to escape from the screw barrel through the nozzle and into the sprue and runners of the mold. At the end of the injection cycle the rotation of the screw is stopped and automatically reversed about one turn to reseat the end of the screw in the nozzle retainer and thus form a mechanical seat at this point and at the same time relieve the pressure of the rubber around the baffle gears. After a suitable "hold-down" period the injection head is removed from the hot mold in order to prevent an undue conduction of heat from the mold to the nozzle and thence to the rubber in the screw cham-

At the time of this operation the rubber in the mold sprue will have been cured sufficiently to prevent movement of the rubber in the mold out through the now-open sprue. After a sufficient curing time the mold is opened, and the parts are removed.

Early Development Work

Very early in the development a number of design problems were encountered. For one thing it was found that the original 10 h.p. motor was underpowered since electrical load readings indicated a requirement of 18 to 22 h.p. when normally loaded natural rubber compounds were used; the Shore hardness of the vulcanizates was in the 60-70 range.

Another particularly annoying problem, most noticeable in the case of natural rubber compounds, was the tendency of rubber to escape past the baffle gear shaft seals and into the baffle gear bearings. Here the rubber would bind the bearings, putting an undue strain on the motor and frequently breaking the screw thread and baffle gear teeth. This problem was overcome by a suitable seal design and by a generous lubrication of the baffle gear bearings. In fact a mechanical force

teed lubrication of these bearings is highly recommended.

The design of the screw thread, particularly at the feed box opening, was the subject of considerable investigation in order to arrive at the most efficient thread profile. Likewise the material and heat treatment of the hardened feed screw required a great deal of development work in order to arrive at a screw material which was hard enough to prevent undue wear and at the same time tough enough to withstand the shocks of production use.

Press Design

The injection head is usually coupled directly to a single-opening hydraulic press. Since injection is made along a parting line of the mold, the rubber entering the mold acts as a mechanical wedge attempting to pry the mold open. Because of this condition the clamping pressure of the press must be as high as possible. Currently in use with 24- by 24-inch molds are 450-ton presses. Because of the unbalanced load conditions even with pressures of this tonnage there is sufficient stretch in the strain bars to allow the mold to open at the injection edge and cause a certain amount of flash. The use of presses with the compression sleeve or preloaded strain bars is highly recommended as a means of reducing the tendency of molds to flash.

Platen Design

In most cases the presses now in use are equipped with electrically heated platens. When properly designed, these are very satisfactory. Current consumption is not exorbitant since the rubber is prewarmed in the injection head to within a few degrees of the mold temperature. Specially wired heaters having a 35-30-35% wattage distribution are now available, and their use is recommended. The heaters should be spaced so that an even temperature is obtained over the entire mold surface at the parting line. The hot plates are individually controlled, preferably with suitable electronic controllers which should maintain temperatures within a fraction of a degree.

The location of the thermocouple control points in the mold is very important in order to obtain and maintain the required temperatures at the mold cavities. A rule of thumb is to place the thermocouples approximately one inch from and on each side of the parting line and

behind one of the main runners.

Mold Design

Mold design and construction is a study in itself. Generally speaking, the design of the mold resembles that of an injection mold for plastics. To provide a proper register between the injection nozzle and the mold sprue or nozzle seat, molds almost invariably are bolted to the press platens. Since the molds are not removed from the press at the end of each heat, the molds should be designed so that the rubber parts are partially or entirely automatically removed from the cavities as the mold is Molds containing cavity pins are generally made with a stripper plate so that after the mold has been partially opened, knock-out bars hold the middle stripper plate while the pin retaining plate is pulled back farther with the result that the pins are withdrawn from the rubber part in the cavity. Molds generally are not hardened, but cavity pins as well as dowel pins and bushings should be hardened and ground. The use of shouldered dowel pins, bushings, and cavity pins is advised. A high-grade normalized steel should be used for mold plates to avoid warping in use with consequent binding of the mold. Stripper plates, if used, should be

of a generous thickness to prevent bellying when contact is made with the knock-out bars.

The size of runners and gates will vary with the size of the mold and the type of compound to be used. Smaller gates and runners may be used with synthetic than with natural rubber compounds; smaller gates and runners may be used with softer and more plastic compounds. For 24- by 24-inch molds an average size for main runners is 3%-inch diameter and 3/16-inch diameter or ¼-inch half round for gates. Since material in gates and runners represents scrap, it is obvious that they should be made as small as possible originally and enlarged as required when the mold is tried out.

Cavities in general and gates and runners in particular must be highly polished and, preferably, flash hard chrome-plated to reduce to a minimum the coefficient of friction between the rubber and the mold. Considerable wear and deformation may occur at the sprue opening owing to nozzle impact; so the use of a replaceable hardened nozzle seat or, alternatively, a replaceable soft

nozzle tip is suggested.

Injection molds are more costly than compression molds, but the longer life, faster turnover, and the possibility of adapting stripping devices usually justify the extra cost, particularly on large-volume production items. Since rubber is injected under high pressure and the mold is used at elevated temperatures, clearances of sliding pins must be sufficient to prevent binding and at the same time small enough to prevent undue leakage of flash along the pins, which in turn could set up a bind condition as the mold is opened. Unfortunately rubber compounds will enter crevices that plastic materials will bridge over. Because of this condition and the fact that rubber injection molds are operated at higher temperatures, the tolerances and fits of moving parts of the mold are even more critical than with plastic injection molds. Shrinkage of injection molded parts is less directional and is of the order of one-half to one-third that of compression molded parts.

Machine Set-Up

It was pointed out previously that approximately 20 h.p. is required to operate the injection head. Obviously this is a much greater requirement than for a standard extruder of the same size. The injection head is so designed that the delivery capacity of the screw is potentially greater than the amount of material that can be delivered through the nozzle. Consequently the rubber is churned in the barrel, and the excess mechanical energy of the motor is converted to heat energy in the rubber so that the rubber is delivered to the mold at an elevated temperature. This preheating of the rubber compound makes possible the rapid cycles used in injection molding. When this fact is appreciated, it may be seen that the proper set-up of the injection molding equipment is a much more critical factor than the compounding of the rubber stock. For instance, with a given time and temperature of cure, the state of cure of a rubber part may be varied over a wide range by varying the temperature of the rubber delivered to the mold. Conversely variations in compounds may be corrected in many cases more easily by a change of machine set-up than by recompounding.

Several factors affect the temperature of the rubber as it comes from the head. One factor is the speed of screw, and for this reason a variable speed drive is almost essential. Another factor is the size of the orifice through which the rubber is delivered. This factor can be varied most readily by advancing or withdrawing the nozzle retainer. Still another factor is the temperature

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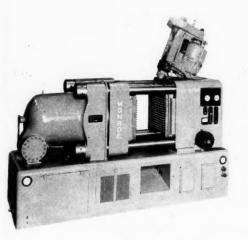
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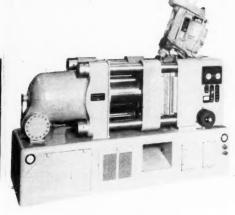
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Monroe Rubber Injection Molding Machine: (Left) Mold Open; (Right) Mold Closed

of the screw barrel which is affected in two ways. The baffle gears are provided with a housing through which cold water may be circulated, and this influences the temperature of the rubber as it enters the high-pressure zone of the screw barrel. This temperature is important enough to warrant the use of a thermostatic control valve to maintain a selected baffle gear housing temperature. The other method of influencing screw barrel temperature is by controlling the length of time the nozzle remains in contact with the hot mold after injection has been completed.

Mold Temperature

It has been found that different types of compounds are molded most successfully in selected temperature ranges. For normally loaded mechanical goods compounds having a cured hardness in the 50-70 range the following mold temperatures are suggested:

Natural rubber and reclaim	
GR-S and nitrile type rubber	325-350° F.
Neoprene	350-375° F

In the case of large molds, or molds for parts with thin sections, high mold temperatures inhibit mold fill because the compound may stiffen owing to incipient vulcanization before all the cavities are filled. Natural rubber compounds tend to "air burn" if mold temperatures are too high, but this tendency is not so noticeable in the case of synthetic rubber compounds.

Compounding

Injection molding, in spite of the rapid molding cycles, does not call for special compounding or "dynamite" stocks. On the contrary a relatively "slow" type of acceleration is preferred, but excellent practical results have been obtained with the thiuram-type accelerators. Control of plasticity is important for uniform day-to-day operations, and soft stocks are to be preferred. Paradoxically stocks may be too soft for the minimum cycle time. With very soft, dead stocks it may so happen that the screw will not build up enough temperature in the compound so that a longer curing time will be needed than in the case of a stiffer stock.

Molding Cycles

Completely filled molds every cycle is the goal for production. Mold fill is influenced by the mold temperature, plasticity of the compound, and condition of the injection head. On new machines a clearance of 0.004inch is provided between the diameter of the screw and the screw barrel. Continued use causes a certain amount

of wear, and when this clearance exceeds 0.015-0.020inch incomplete mold fills are experienced because of loss of pressure in the injection head.

The time of injection will vary with screw speed, but at normal speeds the injection head will deliver approximately 2.3 pounds a minute of compound having a specific gravity of 1.00. Curing cycles are very short. After the injection has been made, the mold is allowed to remain closed for an additional one minute to three minutes, depending on the compound and the size of the part involved.

The overall cycle is the sum of the injection and curing cycles and will depend on the capacity of the mold in question. Molds now in use contain as many as 250 cavities and require up to 12 pounds of rubber per "shot." Even with molds requiring this amount of rubber overall cycle times longer than six minutes are the exception rather than the rule.

Trimming

The chief problem in trimming is separation of the parts from the gates. This may be done by hand or by punch dies, rotary shears, or slitters. Flash, when present, is usually very thin and may be efficiently and economically removed by freezing and tumbling the parts as described by the patents of Kopplin3 or Lubenow.

Summary and Conclusions

Injection molding is still in its infancy, and many important and interesting developments are to be expected at an early date. Since the compound may be fed into the injection head in the form of pellets, injection molding points the way to the "mill-less mill room" of the future. Compounds mixed in an internal mixer may be pelletized and automatically conveyed through spraying and drying tunnels to hoppers over the molding machines. From the hoppers the pellets may be charged directly into the feed box of the injection molding machine, molded, and removed. Thus one would have an automatic system from mixing to curing and eliminate the great variety of equipment now needed for making and handling mold preparations.

The Panel Discussion

The presentation of the paper was followed by a discussion of questions which had been submitted previously. The members of the discussion panel were: Herman Boxser, chief chemist, Acadia Synthetic Products Divi-

³ U. S. Patent No. 2,380,653, ⁴ U. S. Patent No. 2,402,967.

sion, Western Felt Works, Chicago, Ill.; Howard Dodge, general manager, mechanical works division, General Tire & Rubber Co., Wabash, Ind.; J. F. McWhorter, research engineer, Ohio Rubber Co., Willoughby, O.; and James Woodruff, development engineer, Gates Rubber Co., Denver, Colo. The questions and answers fol-

1. Q. Assuming that a choice is to be made between he two methods, what factors determine whether "injection" or "transfer" molding is to be used in

a given application?

A. Selection of the curing method, injection or transfer, will depend on the size, design, and production requirements of the part involved. Faster curing cycles with consequent greater production rates may favor injection molding, but the size of the individual part and limited mold area may favor transfer molding. If the part is complex in design and/or requires inserts, more practical production may be realized from transfer molds. (Woodruff)

It is very difficult to phrase a definite answer to this question since the selection of the method to be used will depend directly upon the part under consideration. It is our belief that in the near future and as experience increases, each new rubber part will have to be analyzed carefully to determine whether compression, transfer, or injection molding is the most economical in the particular instance. Each of the three methods has advantages and limi-

tations peculiar to itself. (Fraser)

2. Q. What are the limitations as to the number of cavities which may be employed in a mold using the (a) injection method or (b) transfer method?

A. In the injection method the number of cavities in a mold depends on the amount of material to be injected and the capacity of the injection head. Molds have been filled successfully up to three minutes' injection time. We prefer from 45 seconds to 11/2 minutes. In the transfer method the number of cavities which may be designed in a mold depends on the size of the press and the design of the mold.

Our molds are 24 by 24 inches overall, leaving an area approximately 20 by 20 inches for insertion of cavities. There is a relation between the projected area of the cavities and the tonnage or clamping capacity of the press. Too many cavities may result in an abnormal total projected area so that the mold may flash because the clamping pressure required is beyond the capacity of the press. On the average an injection head should deliver approximately $2\frac{1}{2}$ pounds of compound (s.g.—1.00) per minute. Many of our molds contain 100-250 cavities and require 8-10 pounds of rubber per fill. This construction results in injection times of 4-5 minutes. The number of cavities which can be filled will also depend upon the plasticity and type of compound used. (Fraser)

3. Q. Can you give an approximate comparison of the amount of stock wasted as mold sprue in (a) an injection mold and (b) a transfer mold as compared with the stock wasted as flash in a well-designed

conventional mold?

A. In a comparison of material loss in the sprues and runners of an injection or transfer mold with material lost as flash in conventional molds the same product should be considered in each case. Actual comparisons of one item made in continuous production runs showed 4-6% loss with an injection

mold, 14-16% loss with a transfer mold, and 18-20% loss with a flash-type compression mold. For general application to injection or transfer molding material, however, loss will depend on product size, number of cavities, and size of sprue and runners required for complete mold filling,

(II oodruff)

In one injection molded item in our production we use a 226-cavity mold; the finished weight of the part is 18.7 pounds per M pieces. The theoretical scrap loss on this mold is 9.8%, but because of incomplete fills the actual loss in production is 12-14%. This part formerly was made in a conventional 240-cavity mold by another concern who have informed us that its scrap averaged 16-18%.(Fraser)

4. Q. Is backrinding a problem in either injection or transfer molding methods? If so, is it more or less troublesome than with conventional molds?

A. The problem of backrinding exists to some extent when rubber parts are molded by the transfer and injection methods. The backrind occurs at the sprue entrance rather than around the edge of the part as occurs on conventional molded parts. More backrinding difficulty has been experienced with nitrile type than with other types of rubber compounds. (McIl'horter)

5. Q. Is there any difference in original physical properties (tensile strength, elongation, hardness, set, flex life, etc.) of rubber articles molded by injection or transfer methods as compared with the physical properties of articles molded by compression?

A. The tensile strength and elongation of a rubber compound molded by the injection or transfer method is usually better than that obtained from the same compound cured by the conventional method. It may be necessary, however, to spot the exact cure on the injection or transfer molded compound to obtain this improvement in physical results. Owing to the high mold temperatures used in transfer and injection methods, a fraction of a minute in cure time may change the hardness and physical properties considerably. This condition is especially true for natural rubber compounds. Compression set results obtained on compounds cured by the injection or transfer method in a fraction of the cure time are comparable to those obtained by conventional methods. (McII horter)

6. Q. How can dielectric heating be applied to either

injection or transfer molding?

A. There is no advantage in applying dielectric heating to injection molding inasmuch as the unvulcanized stock is preheated by the screw as it passes through the injection head. Dielectric heating is of advantage in transfer molding because preheating the stocks tends to save time in bringing the unvulcanized rubber to the mold temperature, thus encouraging better flow and faster cure cycles. (Boxser)

7. Q. Can ordinary platen presses be used for transfer molding, or must special equipment with higher pressures be used? Can more than two platens be

used?

A. Ordinary platen presses, within the capacity of the press, may be used satisfactorily. Any reasonable number of platens or decks may be used in transfer molding. (Dodge)

8. Q. In a transfer mold how many cavities may be fed from each sprue for best efficiency?

A. This is a question of mold design and press capacity. If the cavities are to be filled from one central nold, and sion mold. r transfer epend on e of sprue ld filling.

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transfer cavity, the total projected area of the product cavities may equal the area of the transfer cavity. As many as nine product cavities have been filled from one central transfer cavity. The press capacity should be such that the pressure on the transfer cavity exceeds 12,000 p.s.i. (Dodge)

9. Q. How much time is required to make a mold change in the injection machine?

A. It is our custom to make the mold change in the injection machine after a wait of a few hours with the heat turned off so that the mold can be handled. In our shop we turn off the heat on the mold after our second shift; then the mold is handled by our maintenance men before the starting time of the first shift. Our molds fit into a slotted rail which guides the mold into place. The molds are then tightened by use of three hexagonal-head recessed bolts on either side of the plate. The actual change time for replacement is from 45 minutes to one hour.

10. Q. Have toggle presses ever been tried in injection molding? What is their efficiency compared with

hydraulic presses?

A. In cooperation with a well-known rubber machinery manufacturer we have worked out a lock-type toggle press design that really locks the mold. This press preloads a 24- by 24-inch mold with approximately 500 tons' pressure before the material is injected into the mold, (Dodge)

We believe that, on paper at least, a well-designed toggle press of adequate capacity will have advantages over a hydraulic press of similar capacity. We have designed an 800-ton toggle press which is

now under construction. (Fraser)

11. Q. Is there any upper limit on the size of an object that can be molded in the injection machine? What size are the largest parts that are being molded in regular production at the present time:

A. Our production is rather specialized and falls into three or four definite categories of automotive mechanical goods, all of which are more or less small sized parts. The largest individual item now in production weighs 212 pounds per M pieces. However we have had limited production runs on larger One part, made in a single-cavity mold, contained 14 pounds of compound. We would hesitate to predict the upper limit of size of injection molded articles. (Fraser)

12. Q. Is the heat aging of rubber articles cured for the optimum time at 400° F. in an injection mold poorer than the aging of the same article cured in a platen press for the optimum time at a more conventional

temperature, say 287° F.?

A. The deterioration in aging (measured by the Geer oven method) of compounds cured by transfer and injection methods at a maximum platen temperature of 350° F, is comparable to those cured by conventional methods. Not enough aging test results have been obtained on compounds cured at temperatures above 350° F. to form any conclusions. (McWhor-

As pointed out previously, it is very difficult, if possible, to cure any but the most oxidation resistant synthetics at 400° F. Certainly this temperature is too high for natural rubber compounds, and we doubt if any differences in heat aging results would be discernible between 287° F, compression cures and 325° F, injection cures. A temperature of 325° F. is at/or near the top level for natural rubber compounds. (Fraser)

13. Q. How is the pressure determined in injection

A. The rubber pressure in the injection head of molding machines, as used by Monroe, was determined by electrical (resistance change) strain gages. (Dodge)

14. Q. How is a color or compound change made?

A. Changing from a darker or black compound to a lighter compound generally necessitates disassembly of the pressure chamber of the injection head so that all traces of the darker stock may be removed manually from around the baffle gear bearings. This operation plus reassembly can be done by one man in 2-3 hours. For compound changes the screw will expel most of the first stock; the remainder will be removed as soon as the second stock is fed through the head. Frequently we feed sections of vulcanized runners into the screw to remove the last bit of the first stock. The first two feet of the second stock, when run out of the nozzle, will then remove all the vulcanized scrap. (Fraser)

15. Q. What determines when the mold is filled?

A. When an ideal injection mold has been completely filled, the pressure of the rubber in the cavities becomes greater than the pressure holding the injection head in contact with the mold so that head tends to be forced away from the mold. This motion is picked up by a micro-switch which then cuts off the head motor, stopping further injection of stock.

(II oodruff)

We have not found this method to be too satisfactory, particularly when incomplete fills are encountered. We use a timer to control the injection This timer is accessible to the operator so that he can vary the injection time as conditions Because of plasticity variations from batch to batch the injection time will be correspondingly varied. We have also experimented with pressure switches contained in the mold itself and actuated by the pressure of the rubber in the last cavity to be filled. (Fraser)

16. Q. Can injection molding machines be used for the production of hard rubber articles? Can transfer

molding be used for this purpose?

A. Hard rubber compounds can be injected or transferred into the mold cavity with injection and transfer molding equipment. It is difficult, however, to keep the compounds from blowing if the temperature on the injection or transfer molds is much higher than that used at present for conventional molds. From a standpoint of economics it may not be logical to transfer or injection mold the ordinary hard rubber part. These methods of molding may have application to hard rubber parts with irregular shapes, thin sections, or those containing odd shaped inserts. (Mcll'horter)

17. Q. Do injection molded articles have greater density than the same article cured by compression molding? If so, do injection molded articles have better abrasion resistance because of their greater density? For example, could a better heel be made from a given compound by injection molding than by com-

pression molding?

A. The question of injection molded articles having greater density than the same article cured by compression molding is difficult to answer directly. We know that the specific gravity of both the articles is the same. However we do know, as mentioned by Mr. McWhorter in his answer to Question 5, that the tensile and general physical properties are better

when the part is injection molded. This condition would tend to indicate better abrasion resistance in these articles as well. We believe that a better heel could be made from a given compound by injection molding than by compression molding. (Boxser)

We have not been able to distinguish the difference in density between injection molded and conventional molded parts. We have no data on abrasion tests of injection molded parts. (McWhorter)

- 18. Q. What are the best types of softeners for use in injection molding machine compounds? Are lubricants such as stearic acid and the stearates particu-
- larly desirable? A. Recognizing a difference between chemical and
- physical softeners, chemical softeners are very desirable ingredients in compounds to be injection molded. This point is particularly true in the case of natural rubber compounds. Physical softeners, when used in excessive amounts, may be undesirable. Large amounts of physical softeners may sufficiently lubricate the compound so that the screw will slip and feeding will be difficult. We assume that these softeners are relatively ineffectual in decreasing the coefficient of friction between the rubber and the mold because at injection temperatures the rubber is hot and the insolubility of the softener in the rubber decreases accordingly. Because of these reasons and the high price of stearic acid and stearates we do not recommend their use beyond the normal amount required for activation. However chemical plasticizers as well as physical softeners such as compatible petroleum and coal-tar derivatives are very desirable to reduce the "nerve" of the compound. (Fraser)
- 19. Q. Is the use of reclaimed rubber desirable in injection molded compounds? Does it improve or impair flow characteristics?
 - A. Reclaimed rubber, when added to a compound, does not apparently improve the flow of the compound into the cavity in the injection molding process. The platen temperature of the injection press is lowered for reclaim compounds, since there is a tendency for porosity at 335° F. or above. In relatively lightly loaded natural rubber compounds we feel that the presence of a small amount of reclaim is desirable since it smooths out and kills the nerve of the rubber. This action results in better flow characteristics and mold fill. (Fraser)
- **20. Q.** As a result of the high temperatures obtained in the injection molding machine is it feasible to employ straight inorganic acceleration such as lime, litharge, or magnesia without any organic accelera-
 - **A.** Experimentally, we have produced injection molded parts from inorganic accelerated natural rubber compounds. By suitable manipulation of screw speeds to obtain a high stock temperature in the pressure chamber before injection we have produced parts on the same production cycles as standard organic accelerated compounds. We have not done a great deal of work along this line, but the results to date are very interesting. (Fraser)
- 21. Q. Can high durometer hardness compounds be run successfully on the injection molding machine? What is the hardest stock, to your knowledge, which has been run?
 - A. The highest durometer compounds which we have run successfully on our injection molding machine are in the 75-80 durometer range. We have been able to mold 90 durometer stocks in our machine,

but we have never been able to fill all the cavities in the mold. There is a higher generation of heat by the screw of the injector head when high durometer stocks are used, which tends to cure the stock before it has a chance to flow into all the cavities. (Boxser)

March 1948

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	March,	1948	March, 1947		
UNMANUFACTURED	Quantity	Value	Quantity	Value	
Balata	8,708,099	\$ 505 1,610,727	$\substack{6,313\\12,180,157}$	\$ 7,785 2,231,353	
Gutta percha Latex lbs. Rubber, powdered and	212,105	58 66,906	228,593	91,102	
waste	$\substack{208,800\\1,637,000}$	$\frac{15,983}{124,261}$	$\substack{1,506,000\\2,169,300}$	$\frac{36,705}{171,985}$	
tute	283,100	79,096	461,400	92,484	
TOTALS	11,049,351	\$1,877,536	16,551,763	\$2,631,414	
PARTLY MANUFACTURED					
Comb blanks of hard rubber Hard rubber in rods or		\$1,159		8,	
tubes	*****		5,136	6,561	
ered	7,393	9,876	7,302	7,622	
Totals	7,393	\$11,035	12,438	\$14,183	
MANUFACTURED					
Bathing shoesprs.		8	8.088	\$3,706	
Belting Boots and shoes of rubber.		63,722		74,445	
n.o.p	27,413	49,539	83,623	166,630	
ber soles prs.	32	89	328	1,157	
Cement	******	40,583		43,203	
cotton or rubber	******	2,402	******	5,442	
Druggists' sundries	4	38,187		45,471	
Gaskets and washers	700	20,815		32,691	
Glovesdoz. prs.	763	3,722	2,400	8,298	
Golf balls doz.	497	2,136	348	1,528	
Heelsprs.	8,201	1,640	7,492	983	
Hose		51,135		52,746	
Hot water bottles		2,086	******	3,901	
Inner tubes, n.o.p no.	805	1,776	1,969	6,656	
Bicycle	2,405	1,176	300	116	
Liquid sealing compound		10,118		11,008	
Mats and matting		53,762		33,723	
Nursing nipplesgross	2,391	8,501	1,018	2,807	
Packing		22,424		13,232	
Raincoats	523	1.290	3.275	16,982	
Tires, pneumatic, n.o.p. no.	1,460	44.667	2,558	64,179	
Bicycle no. Solid for automobiles	1,959	2,153	1,766	2,025	
and motor trucks no.	42	1,377	13	267	
Other	*******	4,447		3,035	
Tire repair material		14,478		13,216	
Other rubber manufactures		417,735		312,109	
TOTALS		\$859,960		\$919,556	
TOTAL RUBBER IMPORTS	******	\$2,768,531		\$3,565,153	

Exports of Crude and Manufactured Rubber

UNMANUFACTURED Crude rubber lbs. Waste rubber lbs.	4,651,220 1,101,300	\$873,932 10,777	4,075,388 1,736,600	\$ 753,945 27,328
TOTALS	5,752,520	\$ 884,709	5,811,988	\$ 781,273
PARTLY MANUFACTURED				
Soling slabs of rubber lbs.	5,610	\$ 2,405		8
MANUFACTURED				
Belting, n.o.plbs.	249,620	\$161,325	361,105	\$ 255,772
Belts, fan		1,798		8,913
rubber, n.o.p prs. Canvas shoes with rub-	136,660	214,347	237,910	391,443
ber solesprs.	37,260	35,803	127,554	126,530
Clothing of rubber and				
waterproofed clothing		30,068		24,059
Heels	3,546	300	68,258	5,294
Hose Inner tubes for motor		78,624		95,523
vehicles	44.774	126.055	55,357	127.207
Soles	7.000	3,150	3,300	876
Tires, pneumatic for	1,000	0,100	0,000	0,0
motor vehicles no.	67,792	1.420.198	43.219	678,241
Other no.	2,774	1.981	9.258	9,030
Wire and cable, copper,			-,	
insulated		151,579		161,813
Other rubber manufactures		19,733		74,542
TOTALS		\$2,244,961		\$1,959,243
TOTAL RUBBER EXPORTS		\$3,132,075		\$2,740,156

Oxidative Degradation of Polymeric **Materials**

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f heat stock

vities.

Value

7,785 231,353

91,102

92,484

331,414

6,561

14,183

\$3,706 74,445

66,630

 $\frac{1,157}{43,203}$

5,442 45,471 32,691 8,298 1,528 983 52,746 3,901 6,656 116 11,008 33,723 2,807 13,232 16,982 64,179 2,025

267 3,035 13,216 12,109

5,772 8,913

1,443

6,530

4,059 5,294 5,523

LD

Arthur V. Tobolsky²

A LL hydrocarbons, when exposed to the action of heat, light, and oxygen, will undergo avided tack. The physical properties of polymeric materials are very sensitive to oxidative deterioration because relatively few oxidative cuts of the chain structure will result in a marked lowering of molecular weight and, thereby, decrease tensile strength, or relatively few cross-linkages induced by oxygen will produce a gel structure with resulting embrittlement of the polymers.

Our understanding of the nature of oxidative reactions in hydrocarbons has been greatly furthered by the researches of Farmer⁸ and associates, who emphasized the importance of the hydroperoxides and the fact that the oxidative reactions were radical chain reactions. Bolland and Gee* in recent studies of the autoxidation of ethyl linoleate and other hydrocarbons were able to explain the kinetics of oxygen absorption in terms of a chain reaction. If the hydrocarbon under consideration be written as RH (where the hydrogen in question may be any place along the molecule), the propagation steps of the chain reaction are:

(B)
$$R \cdot + O_2 \xrightarrow{k_2} RO_2 \cdot$$

(C) $RO_2 \cdot + RH \xrightarrow{k_3} ROOH + R \cdot$

The initiation step for the chain reaction at the very beginning of the reaction is somewhat uncertain; one possibility is:

(A)
$$RH + O_2 \longrightarrow R \cdot + \cdot OOH$$
.

After a short time the hydroperoxide formed in Step (C) becomes formed in sufficient quantity so that the rate of decomposition of the hydroperoxides to produce free radicals becomes the rate controlling the initiation step. Bolland postulates that the decomposition of the hydroperoxide is a bimolecular reaction.

(G) ROOH
$$\xrightarrow{k_7}$$
 R·
(exact method of decomposition of the hydroperoxide will be specified later)

Various chain termination steps in this oxidation chain have been postulated. Bolland and Gee consider the following:

$$\begin{array}{c} \text{(D) } R \cdot + R \xrightarrow{\quad k_4 \quad} R \text{-} R \\ \text{(E) } RO_2 \cdot + R \cdot \xrightarrow{\quad k_5 \quad} RO_2 R \\ \text{(F) } RO_2 \cdot + RO_2 \cdot \xrightarrow{\quad k_6 \quad} RO_2 R + O_2. \end{array}$$

At low oxygen pressures Step (D) is assumed to be the most important termination step. At high oxygen pressures Step (F) is the most important termination step. In terms of equations A-G, Bolland and Gee were able to explain the kinetics of oxygen absorption of ethyl linoleate, which after the initiation Step (G) becomes rate controlling and is first order with respect to oxygen pressures at low pressures, and zero order with respect to oxygen pressures at high pressures.

Decomposition of Hydroperoxides

Hydroperoxides formed during oxidation may decompose by several mechanisms. A very attractive mechanism which satisfactorily explains several of the observed oxidation products of 1, 3 dimethylcyclopentane was proposed by George and Walsh:

$$(A) \qquad (B) \qquad (C) \qquad (C)$$

Product (D) can either dimerize to give a diketone, or undergo a chain transfer reaction.

Both the diketone and the monoketone (F) as well as the hydroperoxide are found among the oxidation products of 1-3 dimethyl cyclohexane. The net result of the decomposition of the hydroperoxide is to produce a tertiary radical, a hydroxyl radical, a carbonyl group, and a carbon-carbon cleavage.

Professor Waters, of Oxford University, recently proposed the following termination step for the oxidative chain reaction:

(H)
$$RO_2 \cdot + \cdot OH \xrightarrow{k_8} ROH + O_2$$

which deserves consideration along with the termination Steps (D), (E), and (F).

The place along the hydrocarbon at which hydroperoxides will tend to form is the place most susceptible to radical chain transfer. Farmer pointed out that hydroperoxides are very prone to form on the a-methylene carbon adjacent to the double bond. Tertiary carbon atoms are also prone to formation of hydroperoxides.

Studies of the rate of chemical absorption of oxygen by a wide variety of polymers have led to the conclusion that if polyethylene be considered as a base line of oxidizability, the carbon-carbon double bond and methyl groups along the chain enhance the rate of oxidation; whereas many negative groups retard oxidation.

* Trans. Faraday Soc., 42, 236 (1946).

a Ibid., 42, 94 (1946).

June, 1948

Prepared from a talk before Thiokol Technical Club. Thiokol Corp., Trenton, N. J., Jan. 20, 1948.
 Princeton University, Princeton, N. J.

^a Farmer, Sundralingam, J. Chem. Soc., 125 (1943).

Kinetics of Oxygen Absorption

At high oxygen pressures, Bolland and Gee consider the following to be the rate controlling steps, and they also postulate a bimolecular decomposition of the hydroperoxide.

Initiation

ROOH
$$\frac{k_{7}''}{R} R \cdot + \cdot OH$$
.

(In the case of dimethylcyclopentane, as we have seen, the decomposition of the hydroperoxide leads to a ketone, a tertiary radical, and the hydroxyl radical).

Propagation

$$\begin{aligned} R \cdot + O_2 & \xrightarrow{k_2} RO_2 \cdot \\ RO_2 \cdot + RH & \xrightarrow{k_3} ROOH + R \cdot \end{aligned}$$

Termination

$$RO_2 \cdot + RO_2 \cdot \xrightarrow{\mathbf{k}_6} RO_2 R + O_2$$

Under steady state conditions the rate of oxygen absorption is

$$\frac{\text{-d}[O_2]}{\text{d}t} = k_3 \sqrt[4]{\frac{\overline{k_7''}}{k_6}} |\text{ROOH}|[\text{RH}]$$

which is independent of oxygen pressure.

If the termination step proposed by Waters be accepted, then it is possible to postulate the following mechanism

$$\begin{split} & \text{ROOH} \xrightarrow{\mathbf{k'_7}} \mathbf{R} \cdot + \cdot \text{OH (unimolecular)} \\ & \mathbf{R} \cdot + \mathbf{O_2} \xrightarrow{\mathbf{k_2}} \mathbf{RO_2} \cdot \\ & \mathbf{RO_2} \cdot + \mathbf{RH} \xrightarrow{\mathbf{k_3}} \mathbf{ROOH} + \mathbf{R} \cdot \\ & \mathbf{RO_2} \cdot + \cdot \text{OH} \xrightarrow{\mathbf{k_8}} \mathbf{ROH} + \mathbf{O_2}. \end{split}$$

If the consequences of this mechanism be worked out, it gives the following results:

$$\frac{-\mathrm{d}[\mathrm{O}_2]}{\mathrm{d}t} = \mathrm{k'}_7 \; [\mathrm{ROOH}]$$

The course of oxidation (if this mechanism be true) in the case of 1,3 dimethylcyclopentane proceeds as follows. At the beginning of the reaction every molecule of oxygen absorbed enters the structure as a hydroperoxide. After awhile the rate at which hydroperoxide breaks down becomes equal to the rate at which it is being formed, at which point a steady state in hydroperoxide concentration is obtained. The rate of oxygen absorption continues undiminished, and at this point every molecule of oxygen chemically absorbed forms one keto group, one alcohol group and results in one carboncarbon bond cleavage.

Scission and Cross-Linking

Many of the important changes in physical properties that occur in high polymers during degradation and oxidation are the result of simultaneous reactions which we may term aggregative and disaggregative reactions. Aggregative reactions are reactions such as further polymerization, branching and cross-linking which tend to increase the molecular weight. Disaggregation reactions are reactions such as scission or depolymerization which tend to decrease molecular weight. Cyclization also occurs, and in general the effect on physical properties produced by cyclization is very similar to the effect produced by aggregative reactions.

These processes, which for simplicity we shall term as scission and cross-linking, result from the reactions such as dismutation, coupling, addition to double bonds, etc., which the active species R·, RO₂·, and ROOH discussed in the previous reaction undergo. The relative rates of scission and cross-linking depend on the concentration of the various active species and on the comparative ease with which they undergo the various reactions listed below.

Aggregative Reactions

$$\begin{array}{c} R\cdot + R\cdot \longrightarrow R - R \\ RO_2\cdot + R\cdot \longrightarrow RO_2R \\ RO_2\cdot + RO_2\cdot \longrightarrow RO_2R + O_2 \\ R\cdot + C = C \longrightarrow R - C - C \\ RO_2\cdot + C = C \longrightarrow RO_2 \ C - C \end{array}$$

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Disaggregative Reactions

$$\begin{array}{c} -\text{CH}_{2}\text{CHXCH}_{2}\text{CHXCH}_{2}\text{CHXCH}_{2}\text{CHX} - \longrightarrow \\ -\text{CH}_{2}\text{CHXCH}_{2}\text{CHX} + \cdot \text{CH}_{2}\text{CHXCH}_{2}\text{CHX} - \end{array}$$

$$\begin{array}{c}
O \\
| | \\
CH_2CHXCH_2 \cdot + C \\
X
\end{array}$$

$$\begin{array}{c}
CH_2CHX - + \cdot OH \\
X
\end{array}$$

Low ogygen pressures favor a predominance of R· to RO.: At high temperatures and in the absence of oxygen continued dismutation of the radical R· leads to large-scale depolymerizations in many cases (e.g., polystyrene and polymethyl methacrylate). At relatively low temperatures and in the presence of air RO2 and ROOH preponderate, and the degradation is of the oxidative type. Although scission and cross-linking occur side by side during the degradation in air of almost all polymeric materials, the separate rates may be isolated and measured by certain devices. Degradation in dilute solution in inert solvents isolates the scission reactions because the molecules are kept sufficiently far apart to suppress cross-linking. In addition measurements of continuous and intermittent relaxation of stress and permanent set have been used to study these reactions in vulcanized rubbers.

If the scission reaction predominates, the polymers will become softened during degradation; whereas if the cross-linking reactions predominate, the polymers will tend to harden.

(Continued on page 371)

⁶ Andrews, Tobolsky, Hansen, J. Applied Phys., 17, 352 (1946).

The Aging of GR-S¹

A Review of the Literature

Thomas H. Harris² and Robert D. Stiehler²

A LTHOUGH the better aging properties of GR-S, as compared with natural rubber. as compared with natural rubber, were recognized early in the development of this synthetic rubber, most of our knowledge of this subject has been gained during the past four years. A symposium held in Birmingham, England, in 1945, devoted to "The Physical and Chemical Breakdown of Rubber" (1),3 included considerable data of this nature on GR-S. In this country during the past few years a number of valuable contributions on various aspects of the aging phenomena has appeared.

These researches, concerned with such factors as the effect of light, temperature, oxygen, ozone, compounding ingredients, and conditions of curing, have made it possible to draw certain conclusions as to the mechanism of aging and the requirements for new and more adequate accelerated aging tests. It is evident, however, from these studies that more investigations of the fundamental type are necessary before such a method is realized. In the following pages an attempt will be made to summarize the more important results on this subject with the hope that it may be useful in subsequent work.

Effect of Deteriorative Factors on GR-S

The factors directly responsible for the aging of GR-S are apparently the same as those for natural rubber. The action of primary agents, oxygen, ozone, and possibly oxides of nitrogen is influenced by secondary factors and agents such as temperature, light, compounding ingredients, and conditions of curing.

Oxygen. The presence of double bonds makes the GR-S molecule subject to attack by oxygen the same as natural rubber and other unsaturated compounds. Differences both in rate and mechanism of attack by oxygen are to be expected in unsaturated polymers, depending upon the type of groups adjacent to the double bond. The oxidative behavior of GR-S was found by Shelton and Winn (2) to be different from that described by Kohman (3) for natural rubber. Three distinct stages of oxidation are involved: an initial rapid rise, a slower constant rate period, and a final upswing which approaches a linear rate of greater magnitude. The overall rate of oxidation of GR-S is slower than that of natural rubber. Crabtree and Kemp (4) found the oxidation rate of GR-S, exposed to light, to be about onefourth that of natural rubber.

When oxygen is carefully excluded, GR-S undergoes little change in tensile strength (5). This conclusion is seemingly contradictory to the results of Sturgis, Baum, and Vincent (6) who observed little difference in the aging of GR-S in nitrogen and in air. These latter results may be explained, as pointed out by the authors, by the presence of peroxides formed prior to the test.

TEMPERATURE. Aging reactions increase in rate with an increase in temperature. The effect of temperature

on oxygen absorption of GR-S was investigated by Shelton and Winn (7). They obtained a temperature coefficient for oven aging of GR-S of approximately 2 per 1° C., which is in agreement with that reported by Harrison and Cote (8). For both tensile strength and elongation at break, however, higher values of 3.09 and 2.63, respectively, were found during oxygen-bomb aging. Shelton and Winn regard the values of 2 and 3 as approximate values for the temperature coefficient of the cross-linking and chain scission reactions respec-

Temperature coefficients of aging changes were also

determined by Juve and Garvey (9).

LIGHT. There is no evidence to show that light alone is responsible for any serious degradation of GR-S. Aging effects, previously attributed to light, are now known to result from the combined action of light and oxygen. Light catalyzes the formation of organic peroxides of GR-S, and the shorter wave lengths are more effective. Short ultra-violet light may form ozone which attacks GR-S. In the earth's atmosphere ozone is formed only in the upper atmosphere and is brought to the surface of the earth by diffusion and air currents. It is these latter products which are the cause of degradation. Crazing is caused by light induced oxidation of a thin resinous surface layer. Staining, a photochemical reaction of the antioxidant, is more serious in lightcolored stocks. A thorough discussion of the question of light in aging is that of Crabtree and Kemp (4).

Ozone. The cracking of rubber under stress was until recently, considered to be due to the action of light. Crabtree and Kemp (4) in an excellent discussion of the effect of ozone on natural rubber and GR-S offer proof for the suggestion of earlier workers (10) that cracking is due to ozone and not to light. The action of ozone on GR-S was shown to be more pronounced in the latter stages of the reaction. Newton (11) reached the same conclusions as Crabtree and Kemp regarding the singular importance of ozone in cracking and discusses the resistance of various synthetic rubbers in relation to composition of the polymers. GR-S was found to be definitely less resistant to ozone attack than natural rubber. Waxes appear to be more efficient in preventing cracking in GR-S than in natural rubber (4).

METALLIC IMPURITIES. According to Neal and Ottenhoff (12), copper and manganese, introduced in soluble form as the stearates, showed less catalytic effect on the aging of GR-S than on that of natural rubber. The effect of polymer-soluble iron on the aging of both unvulcanized and vulcanized GR-S was recently investigated by Albert, Smith, and Gottschalk (13). In contrast to natural rubber, the deleterious effect of iron on vulcanized GR-S was more pronounced than either copper or manganese. Relatively large amounts of iron, however, were necessary to produce much effect on the aging of GR-S vulcanizates.

Effect of Compounding Ingredients on Aging of GR-S

The aging resistance of GR-S is influenced by the nature and proportions of the compounding ingredients

Sulfur and Accelerators. Neal and Ottenhoff (12) found that simultaneously reducing the sulfur and increasing the accelerator content was effective in reducing the increase in modulus during oxygen-bomb aging. In contrast to natural rubber, however, this had little effect on the loss of tensile strength. Such changes in the sulfur-accelerator proportions were found to accelerate rather than retard the deterioration in dynamic properties. Sturgis, Baum, and Vincent (6) studied the effect of sulfur and accelerator proportions on the oven

June, 1948

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Prepared from a paper presented before subcommittee XV, A.S.T.M. Committee E-11, Washington, D. C., Mar. 4, 1948.

2 National Bureau of Standards, Washington 25, D. C.

3 Numbers in parentheses refer to Bibliography items at end of this article.

aging of GR-S. They showed that different accelerators with varying degrees of activity offered no improvement in hardening resistance. This point was interpreted to mean that continued vulcanization was

not an important factor.

Hendricks (14) and Breckley (15) investigated the effects of compounding ingredients on the aging of GR-S. These workers found that highly accelerated, low-sulfur stocks have superior aging characteristics. Breckley found that combinations of organic bases with magnesia or sodium hydroxide were particularly effective accelerators for producing superior aging GR-S stocks.

Hendricks (16) in a discussion of the heat problem in GR-S points out that heat build-up and heat stability are separate problems and that compounding methods usually satisfactory for one are opposed to the other. He further found that compounds of improved heat stability and heat build-up could be obtained by use of effective accelerator combinations with proper amounts of sulfur.

Scott (17) submitted data which are in agreement with that of previous workers as to the importance of low-sulfur content to good aging resistance.

Hunter (18) found that low sulfur and powerful accelerators were a practicable means of achieving good

aging properties.

Non-Sulfur Vulcanization. Sturgis. Baum, and Vincent (6) showed that GR-S could be vulcanized with a number of non-sulfur containing compounds, and vulcanizates obtained with trinitrobenzene and 2,4-dinitrochlorobenzene were found to show superior resistance

to deterioration by heat.

ANTIONIDANTS, GR-S contains an effective antioxidant added during production. Additional antioxidant and different types of antioxidants were found by Massie and Warner (19) to be beneficial in the absence of high sulfur and persistent accelerators. According to Cole and Field (20) phenyl-beta-naphthylamine affords no protection to thin unvulcanized films of GR-S against light-induced oxidation.

Basic Mechanisms of Aging of Natural Rubber and GR-S

The aging of natural rubber and GR-S may be due to one or more of the following processes: (a) oxidation, (b) polymerization, (c) depolymerization, and (d) molecular rearrangement. Evidence from recent fundamental investigations points to oxidation as the most important process involved. By means of infrared absorption patterns before and after aging, Field. Woodford, and Gehman (21) and Cole and Field (20) showed that definite structural changes occurred, and the changes were associated with the formation of various

carbonyl and hydroxyl groups.

Shelton and Winn (7) showed that the fundamental reactions of oxygen involved in the deterioration of both natural rubber and GR-S are the same and appear to be (a) chain scission, which results in a decrease in tensile strength and in stress at a given elongation, and (b) cross-linking, which increases the stress at a given elongation and produces a general hardening. The difference between the behavior of natural rubber and GR-S under a given set of aging conditions may be attributed to a difference in the relative rates of these two reactions. In natural rubber, chain scission tends to predominate; whereas, in GR-S, cross-linking predominates except at high oxygen concentrations.

The chain-scission reaction increases in rate with both an increase in temperature and in oxygen concentration. The cross-linking reaction is similarly influenced by temperature, but it is almost unaffected by oxygen concentration above that in air and probably less. Although both reactions are initiated by oxygen, chain scission appears to require considerable additional oxygen to cleave the molecule in two. Cross-linking, on the other hand, can apparently occur with only minimal amounts of oxygen. These conclusions were deduced by Shelton and Winn (7) from the temperature coefficients of the rate of hardening and rate of decrease in tensile strength.

Tobolsky and coworkers (22), by means of set and stress relaxation measurements, have made an extensive study of the scission and cross-linking mechanisms in aging. They developed mathematical relations from which stress relaxation can be calculated as a function of time and temperature. This work represents a fundamental approach to an understanding of the reactions

involved in degradation and aging.

Hendricks (16) believes that the hardening of GR-S is caused by a rearrangement of unstable sulfur groups to form stable cross-links. No evidence was presented, however, to substantiate this hypothesis.

Accelerated Aging Methods

Accelerated aging data on GR-S have been obtained with methods originally developed for natural rubber. Neal and Ottenhoff (12) in a study of the resistance of GR-S to various types of aging employed three well-known methods, i.e., the Bierer-Davis oxygen bomb, the Geer oven, and the air-pressure heat method. The results obtained with GR-S and natural rubber in these tests are in general typical of those of other workers and shown below.

Onygen Pressure Test. In these tests GR-S showed excellent resistance as judged by retention of tensile strength. A change in modulus occurred, with marked stiffening which could be reduced in magnitude by simultaneously reducing the sulfur and increasing the accelerator. There was little difference between natural rubber and GR-S with respect to elongation at break, but GR-S showed an increase in tear resistance in contrast to natural rubber. GR-S showed a slight increase in hardness over natural rubber in this test.

Air Oven. The most striking feature of this test was the large change in modulus (an increase of 850%) for GR-S. Reduction of sulfur and increase of accelerator still showed a 400% increase in modulus valves for GR-S during air oven aging. This test was more severe as regards ultimate elongation of the GR-S stock than the

oxygen pressure test.

AIR-PRESSURE TEST. This test proved to be the most severe of the tests. Again the GR-S stocks retained their tensile strength better than did natural rubber. The tear resistance increased at first in this test, but later

showed a marked decrease.

Neal and Ottenhoff found no real correlation of the results in the different tests. The reason for this lack of correlation, now known from the work of Shelton and Winn (7), is that the reaction or reactions predominating in aging under one set of conditions are not the same as those reactions predominating under different conditions.

A comprehensive program on the aging of GR-S vulcanizates is being undertaken by the Research Association of British Rubber Manufacturers and the initial results of this study have been reported by Scott

OZONE AGING. Crabtree and Kemp (4) showed that natural rubber and GR-S, exposed to outdoor weather—
(Continued on page 371)

Strain Test for Evaluation of Rubber Compounds

Frank L. Roth² and Robert D. Stiehler²

THE inherent variability of measurements for determining the stress-strain properties of vulcanized rubber is notorious. It has been customary to ascribe the cause of the variability entirely to the rubber. This allegation may be largely true in the case of stress and elongation at failure, but measurements by means of the strain test definitely show that the measurements are responsible for a large portion of the observed variations of points on the stress-strain curve below failure.

Since the advent of the Government Synthetic Rubber Program in 1942, there has been an intensified effort to improve the precision of stress-strain testing. Measurements of the stress-temperature relations for pure gum vulcanizates of GR-S and natural rubber by Roth and Wood (1)³ suggested that the precision and accuracy of stress-strain measurements might be greatly improved by measuring the elongations of rubber specimens suspending predetermined loads. Strain tests made in late 1944 on vulcanizates of X-125 GR-S and in 1945 on vulcanizates of natural rubber at the Institute Agronomico do Norte in Belem, Brazil (2), confirmed this suggestion. In the development of this test strain measurements for the evaluation of vulcanized rubber have been found to yield information which has not been revealed by the usual stress-strain measurements.

Procedure

In the strain test a predetermined load is applied to a specimen, and the elongation is measured after the load has been applied for a specified time. The load is selected to produce a specified force per unit of cross-sectional area of the unstretched specimen.

The early tests were performed with extremely simple equipment which required manual application of the load to a standard dumbbell-shaped specimen having a reduced section two inches long. Most of the data reported here, however, were obtained by means of a tester developed by Holt, Knox, and Roth (3). This tester is designed to minimize the number of manual operations and thereby to reduce the number of subjective errors. These authors also describe the preparation of the test specimens and the measurement of their thickness, in addition to the measurement of strain at the specified stress. Strip specimens approximately 1/4-inch wide and six inches long are used, since specimens with enlarged ends are not required for this test. These specimens can be cut from the standard six- by six- by 0.075-inch test sheet and permit the distance between bench marks to be increased to improve precision. The bench marks are spaced 10 centimeters apart so that elongations can be read directly by means of a millimeter scale.

In early experiments a stress of 1,000 p.s.i, was used for vulcanized specimens of GR-S and GR-I prepared

Fig. 1. Creep of GR-S Specimens under Tensile Stress The creep is shown as the difference between the elongation at any specified time and that at 10 seconds after application of the stress.

The time scale is logarithmic.

according to the Specifications for Government Synthetic Rubbers (4). In the course of development of the method the stress has been reduced in several steps to 400 p.s.i., which is employed at present for vulcanized tread-type compounds. The stress of 400 p.s.i. was selected because it is in the region where the ratio of elongation to stress attains a maximum value. A stress of 100 p.s.i. has been selected for gum vulcanizates of natural rubber and other rubbers in order to avoid effects of crystallization. The stress of 100 p.s.i. can also be used for studying gum vulcanizates of GR-S.

For control testing and many research purposes stresses of 100 to 400 p.s.i. are sufficient. Accordingly, the tester developed by Holt, Knox, and Roth (3), is provided with weights for applying a stress of 100, 200. or 400 p.s.i. Stresses lower than 100 p.s.i. can be used provided the elongation is above 50%. Minor modifications in the apparatus or procedure are necessary to measure lower elongations precisely. Stresses higher than 400 p.s.i. are obtained by suitable adjustment of the weights and are limited only by the strength of the specimen or the limiting extension of the specimen by the tester.

When the load is applied, the specimen elongates rapidly at first and then more slowly as time elapses. The precision of measurement increases as the rate of creep decreases, thus observations can be made with greater precision as the time after application of the load increases. It is necessary, however, in a control test to keep the time for making a test at a minimum compatible with the requisite precision.

Measurements have been made at various intervals between 10 seconds and 10 minutes after application of the load. These measurements indicated that the elongation of the specimen increases approximately linearly with the logarithm of time. For example, in Figure 1, the increase in elongation after the 10-second reading is plotted against the logarithm of time. The test specimens were prepared from GR-S, according to the Specifications for Government Synthetic Rubbers (4). Vulcan-

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^{₹ 30} IN PERCENT. ELONGA 20 CURE-90 MINUTES AT 292°F, STRESS-400PM TIME IN SECONDS

³ Presented before the Division of Rubber Chemistry, A. C. S., Chicago, Ill., Apr. 22, 1948.

^a National Bureau of Standards, Washington 25, D. C.

^a Numbers in parentheses refer to bibliography references at end of this

TABLE 1. PRECISION OF STRAIN MEASUREMENTS

				Number of		Within a Sheet %		
Type o	of Rubber	Date of T	ests	Sheets Tested	Stress P.S.I.	25 Min.†	50 Min.†	90 Min.†
*GR-S	X-125	December	1944	2	1000	7.5	5.9	4.3
	X-179	February	1945	22	1000	2.8	2.5	1.4
	X-224	July	1945	9	1000	4.9	2.4	1.7
	X-224	July	1945	9	1000	3.8	2.2	1.9
	X-224	July	1945	9	1000	2.6	2.0	1.9
	X-243	December	1945	20 12	1000	3.3	1.7	1.8
	X-224	April	1946	12	750	1.5	3.1	1.8
	X-289	April	1946	12	750	2.0	3.2	1.2
	X-289	January	1947	11	600	3.0	1.1	0.9
	X-346	January	1947	21	600	3.0	1.5	0.8
	X-346	July	1947	20	600	2.6	2.2	1.4
	X-387	July	1947	40	600	3.1	2.0	1.4
	X-387	December	1947	16	600	3.2	1.5	1.8
	X-418	December	1947	36	600	3.5	2.1	1.3
	X-412	December	1947	30	600	3.8	1.5	2.8
	X-418	February	1948	54	400	2.5	1.2	‡0.7
						20 Min.§	40 Min. §	80 Min. §
GR-I	Y-100	April	1945	20	1000	3.3	2.9	2.3
	Y-102	January	1947	8	600	1.7	1.5	1.3
	Y-103	January	1947	16	600	1.6	1.1	1.2
						10 Min. †	10 Min. §	20 Min.§
GR-M	(10 lots)	July	1946	20	600	3.1	2.5	2.2

^{*} Used two-inch dumbbell-shaped specimens and applied load manually. † Time of cure at 292° F.

Cured 100 minutes at 292° F. Time of cure at 307° F.

Table 2. Comparison of Precision of Strain Test with Precision of Usual Tensile Stress Test

			Compounds of A-240 Ole-5 valcamzed						
Line Test		25' at 292° F.		50' at 292° F.		90' at 292° F.			
	Statistics	Stress P.S.I.	Strain %	Stress P.S.I.	Strain	Stress P.S.I.	Strain %		
1 2 3 4 5 6 7 8	Stress Strain Strain Strain Stress Strain Strain Strain	Mean Mean Mean S. D.* S. D.* △E △S†	407 350 400 450 18.8	300 298.9 328.9 355.3 4.36 0.564	1089 1050 1100 1150 30.2	300 324.7 335.2 344.8 3.26 0.201	1543 1500 1550 1600 45.2	300 330.1 338.2 348.8 2.74 0.187	
9		Ratio §	2.44		1.86		3.07		

izates cured 25 and 90 minutes at 292° F. were employed. Specimens cured 25 minutes were tested with loads of both 100 and 400 p.s.i. to determine the effect of load. The specimens cured 90 minutes were tested only with a load of 400 p.s.i.

As can be seen in Figure 1, the rate of creep is approximately the same for the two loads; whereas the rate of creep for specimens cured 90 minutes is approximately one-third of that for those cured 25 minutes. None of the natural or other synthetic rubber vulcanizates investigated, including some without fillers, had a greater rate of creep than the GR-S carbon-black compound cured 25 minutes at 292° F. In those cases where crystallization occurred, the rate of creep was a maximum at intermediate loads. This phenomenon is in accordance with the observations for unvulcanized natural rubber by Treloar (5) and for vulcanized natural rubber by Field (6) and by Wildschut (7).

From a study of the data in Figure 1, in which the time is plotted on a logarithmic scale, a time interval of 60 seconds was selected for making subsequent measurements since observations made between 56 and 64 seconds are less in error due to creep than to errors in determining cross-sectional area of the specimen. With the automatic timing of the tester designed by Holt, Knox, and Roth (3), it is possible to retain the same precision with shorter time intervals by reducing the period permitted for observation by a proportionate amount; that is, measurements made between 28 and 32 seconds are as precise as those made between 56 and 64 seconds. The absolute value of the elongation, however, will be lower at 30 seconds than at 60 seconds, as is indicated in Figure 1.

Precision of Test

The high precision of the strain test is achieved largely by measurement of the elongation under nearly static conditions, instead of taking observations as the specimen is being extended. This precision can be seen in Table 1, which gives the standard deviations among specimens from the same sheet of vulcanized rubber. The values represent data obtained during the evaluation of reference lots of Government Synthetic Rubbers. With the exception of the values for X-125 GR-S, which were obtained with two-inch dumbbell specimens and manually applied loads, the standard deviations are essentially identical for all rubbers tested during the past three years and are comparatively small. Since these values are in units of elongation, they cannot be compared directly with those for tensile stress. A comparison can be made, however, by converting one into the units of the other. In Table 2 the standard deviations for strain are converted into equivalent stress values and compared with those for tensile stress as follows:

- 1. Six sheets from the same compounded batch of X-243 GR-S were cured for each of the times indicated: three sheets of each cure were used for measurements of tensile stress and three for those of strain.
- 2. The tensile stress at 300% elongation was measured on six specimens from each of the three sheets; the elongation was measured on 18 specimens from each sheet, six at a stress approximately equivalent to the average tensile stress at 300% elongation, six at a stress 50 p.s.i. lower, and six at a stress 50 p.s.i. higher. The mean values for each of these properties are shown in the first four lines of Table 2.

^{*} Standard deviation of specimens within a sheet.
† The change in elongation for a change in stress of one p.s.i. (line 4 minus line 2) /100.
† Standard deviation of strain measurements expressed in equivalent stress units, which is calculated by dividing the strain standard deviation by $\triangle E$ $\triangle S$, line 6/line 7.
§ Ratio of standard deviation for tensile stress to that for strain both expressed in p.s.i., line 5/line 8.

TABLE 3. VARIANCES OF STRESS AND STRAIN MEASUREMENTS

	Min.	Variances				
Type	Cure	A Batch	В	C	D	
GR-S	292° F.	Means*	Specimens‡	B/5	C/A	
		Stress at 300	C Elongation			
		P.S.I.2	P.S.I.2	P.S.I.2	C7	
X-346	25	509	1320	264	52	
	50	824	1297	259	31	
	90	708	1801	360	51	
X-289	25	133	276	55	41	
	50	658	931	186	28	
	90	1847	1120	224	12	
		Strain	at 600 P.S.I.			
		962	C' 2	C 2	Co	
X-346	25	78.9	9.00	1.80	2.3	
	50	24.6	2.16	0.43	1.8	
	90	1.8	0.65	0.13	7.2	
X-289	25	56.0	8.86	1.77	3.2	
	50	5.3	1.12	0.22	4.2	
	90	8.9	0.73	0.15	1.7	

^{*} Variances apply to 27 batches of X-346 GR-S and 11 batches of X-289 GR-S.
‡ Variances apply to five specimens from a sheet from each batch, i.e., a tot 1 of 135 specimens of X-289 GR-S.

TABLE 5. STRAIN AND SET DATA FOR SHEETS WITHIN A BATCH

		Strain	at 600 P.S	S.I.—%		Set +-%	
Sheet	25	Min.*	50 Min.*	90 Min.*	25 Min.*	50 Min.*	90 Min.*
1		471	254.6	194.3	12.15	4.50	3.23
2		484	255 7	193.7	114.85	4.74	3.16
3		468	251.2	192.9	112.66	4.54	3.15
4		498	258.0	191.5	114.07	4.91	3.36
5		465	253.0	192.9	112.70	4.68	3.36
6		468	253.6	191.9	12.48		3.23‡
	Av.	476	254.5	192.9	13.15	4.67	3.25

^{*} Time of cure at 292° F.

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were calculated from the strain measurements in lines 2 to 4 and are shown in line 7. The values of the standard deviations in line 6 were divided by the corresponding values in line 7 to obtain the equivalent standard deviations in units of stress decreases.

tions in units of stress shown in line 8.

4. The ratios of the values in line 5 to those in line 8, given in the last line, indicate that the standard deviations for tensile stress measurements at 300% elongation are approximately $2\frac{1}{2}$ times as large as the equivalent values for strain measurements.

Another comparison of the precision of measurements made by these two methods of test is possible by subjecting the data obtained on reference lots of synthetic rubbers to an Analysis of Variance (8). Such an analysis for X-289 and X-346 GR-S is given in Table 3. Column A lists for each property the variances (squares of standard deviations) among batch means, and Column B lists the variances among specimens from the same batch. The values in Column .4 may be resolved into two components, one due to variations from batch to batch and the other to variations among specimens from the same batch. Since five specimens from each batch were tested, the contributions from variations among specimens to the variances in Column A are 1/5 of the variances in Column Band are listed in Column C. Column D expresses this contribution as a percentage of the observed variance among the batch means. In the case of elongation at 600 p.s.i., testing variations account for approximately 3.4% of the observed batch-to-batch variations, which is about one-tenth the corresponding percentage for stress at 300% elongation. Similar results have been obtained in the evaluation of Y-102 and Y-103 GR-I. Other laboratories (9) have noted comparable improvements in pre-

TABLE 4. TYPICAL DATA FOR STRAIN AND SET OF INDIVIDUAL SPECIMENS

	Strain at 600 P.S.I.—Co			Sett-Co			
Date 1946	25		50 Min.*				90 Min.
Oct. 22		450	245	190	10.5	4.5	3.0
Oct. 22		450	0.4 5	100	10.5	4.5	3.0
		452	242	100	$\frac{10.5}{10.5}$	4.6	3.2
		456	245	101	10.6	4.0	
		457	245	101	10.6	4.5	3.2
		401	240	131	10.0	4.0	0-2
	Av.	453			10.5		
Oct. 23		492	256	190	10.5	4.8	3.2
		485	256	190	10.8	4.8	3.4
		484	256	192	10.7	4.8	3.3
		488	255	190	10.7	5.0	3.3
		485	257	190	$\begin{array}{c} 10.7 \\ 10.7 \end{array}$	5_0	3.3
		487	256	190	10.7		
Oct. 24		486	248		13.4	5.0	3.0
		484	250	194		5.0	3.0
		481	250	194	13.4	4.9	3.5
		485	250	192	13.6	4.9	3.5
		485	249	193	13.6	5.0	3.5
	Av.	484	249	193	13 5	5.0	3.3
Oct. 29		446	244	190	12.0	4.4	3.8
		446	241	190	12.3	4.4	3.8
		445	243	190	12.3	4.2	3.6
		448	242	190	12.4	4.3	3.7
		446	240	190	12.3	4.3	3.6
	Av.	446	242	190	12.3		3.7
Oct. 30		486	252	193	13.5	5.0	3.4
		486	252	191	13.5	5 0	3.5
		486	250	190	13.2	5.0	3.5
		485	249	189	13.5		3.4
		487	247	188	13.4		3.5
	Av	186	250	190	13.4	5.0	3.5

^{*} Time of cure at 292° F. X-289 GR-S vulcanizates prepared according to the Specifications for Government Synthetic Rubbers, effective January 1, 1946. † Set measurements made one hour after strain measurements on same

cision of testing by means of the strain test.

Applications of Strain Test

The high precision of the strain test has made it possible to obtain a reliable evaluation of vulcanized rubber samples by means of relatively few measurements. For example, it has been possible to determine with little effort the variations introduced during compounding and curing, the heterogeneity of a single sheet of rubber, and the change in stress-strain properties during storage of vulcanized rubber.

In Table 3 the large variance among batch means compared to the variance among specimens for the strain data indicates that there was considerable variability in the compounding and curing operations. Similar data are shown in Table 4, where values for individual specimens from five batches prepared on different days are The agreement among the specimens from a single sheet from each batch is excellent, but the batch averages vary considerably. In order to determine whether this variation is related to the compounding or curing procedure, six sheets from the same batch were vulcanized simultaneously. The average value for each of the six sheets is given in Table 5. The variation among sheets cured from the same batch is considerably more than expected from specimen variations and is an appreciable fraction of the variation among batches noted in Table 4. From an Analysis of Variance (8) made on data, not reported here, for approximately 100 pairs of sheets of X-412 and X-418 GR-S vulcanizates, it was inferred that the true variance among batches is approximately two times the true variance among sheets within a batch.

In addition to its use for detecting compounding and curing variables the strain test is sufficiently sensitive to detect variations within a single sheet of vulcanized rubber. The narrow specimen used in this test makes it pos-

[†] Set measurements were made one hour after strain measurements on same specimens.

‡ Mean for six specimens; other values are means for twenty specimens.

^{3.} The standard deviations among specimens were calculated for tensile stress and for strain measurements and are given in lines 5 and 6 of Table 2. The change in elongation produced by a change in stress of one p.s.i.

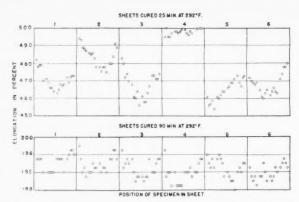


Fig. 2. Heterogeneity within and among Sheets from Same Compounded Batch

The mean value for each sheet and the conditions of test are given in Table 5.

sible to cut 20 specimens from a sheet six inches square. The variations among 20 such specimens is seen in Figure 2. This figure shows the individual strain values for the sheets vulcanized 25 and 90 minutes, respectively, and summarized in Table 5. The elongation of each specimen is plotted in the order of its position in the sheet. The trends in values noted across most sheets are believed to be due to grain effects caused by flow during the early part of vulcanization. This conclusion is supported by the studies of Gurney and Gough (10).

Since 20 specimens can be cut from a single sheet, it is possible to study the change in stress-strain properties of vulcanized rubber during storage. Figure 3 shows the average change in five sheets of each of three GR-S vulcanizates during the first six days of storage at 82° F. These data show the marked stiffening of undercured rubber during the first 24 hours after vulcanization and support the minimum aging period of 24 hours between vulcanization and testing required by A.S.T.M. Method

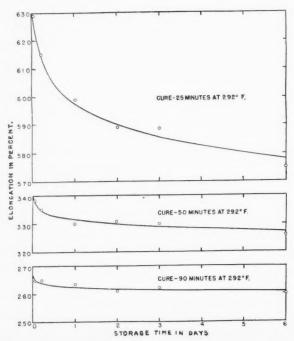


Fig. 3. Effect of Storage at 82° F. on Elongation at 600 p.s.i. for Vulcanizates of X-243 GR-S

D15-41 and of 16 hours by the Specifications for Government Synthetic Rubbers. It should be emphasized that the strain test made it possible to obtain these results from only one batch for each cure.

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Method for Measuring Set

Specimens subjected to the strain test can be conveniently used for precise measurement of extension set for a specified stress since the specimens are subjected to a uniform stress for a uniform period of time. Such measurements of set after the specimens have been allowed to

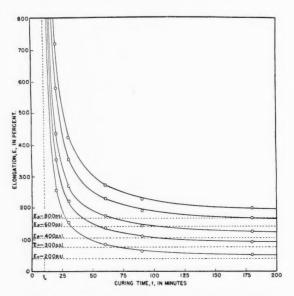


Fig. 4. Elongations for Various Stresses νs . Time of Vulcanization of X-387 GR-S at 292 $^{\circ}$ F.

The solid lines are hyperbolas calculated from the equation, (t - $t_{\rm o})$ (E - $E\infty)$ k= 1, using the following values for the parameters:

Stress P.S.I.	Min.	Exc %	k (Min. x %)-1
200	11	41	0.000488
300	11	78	.000392
400	11	107	.000329
600	11	142	.000250
800	11	168	.000203

recover for one hour are presented in Table 4. As seen in this table, the dispersion of values for specimens from the same sheet is remarkably small so that it is easy to detect variations among sheets or batches. The results of set measurements shown in Table 5 indicate that there is an appreciable variation in set among sheets from the same batch, although not so large as that among batches shown in Table 4.

Determination of Vulcanization Parameters

In the usual measurements of tensile stress ("modulus") of rubbers vulcanized for different periods of time, considerable ambiguity arises in differentiating between cure characteristics and the inherent stiffness of the rubber compound. An examination of strain data plotted as a function of time of cure, as in Figure 4, indicates that the curve is a rectangular hyperbola of the form (E-a)(t-b) = c, where E is the elongation at time of cure t. On differentiation, this equation becomes: $-dE/dt = (E-b)^2/C$. This equation suggests that elongation at a fixed stress decreases with time of cure according to the laws of a second-order reaction, in which the reaction rate constant (k) is 1/C. The parameter b is independent of the time of cure and corresponds to the elongation (E^{∞}) for infinite cure time. The parameter a is the constant of

integration and corresponds to the time (t_o) at which the elongation begins to decrease. This time may be considered as the point of incipient cure or scorch time. Thus strain data may be useful for determining three parameters of vulcanization; (a) scorch time, t_o (b) reaction rate constant, k, and (c) a structure factor, E^{∞} . which may be associated with the inherent stiffness of the rubber compound. This stiffness may be due to the structure of the polymer or the nature and concentration of the compounding ingredients. As seen in Figure 4, E^{∞} is a function of the applied stress; whereas $t_{\rm o}$ is independent of it. The reaction rate constant, k, is also a function of the applied stress which must be considered in comparing compounds with different stress-strain characteristics.

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This relation has been found to apply to vulcanized GR-S, GR-M, and natural rubber compounds. In the case of rubbers which crystallize on stretching, however, to decreases and may become negative as crystallization increases. Accordingly, if to be regarded as a scorch time, the stress should be sufficiently low to avoid crystallization. Reversion is another phenomenon which affects the vulcanization parameters. When reversion occurs, E reaches a minimum and then increases instead of approaching an asymptote as the cure time increases indefinitely. Further, the parameters are extremely sensitive to the observed variations between sheets noted in Table 5. It is, therefore, essential to use the average value from several sheets in order to obtain reliable values for the parameters. Employing the average values obtained in the evaluation of X-289, X-346, and X-387 GR-S, the constants given in Table 6 were calculated for the vulcanization parameters, t_0 , k, and E^{∞} .

TABLE 6. VULCANIZATION PARAMETERS DERIVED FROM STRAIN DATA

Type of GR-S	Date Tested	Scorch Time	Reaction Rate Constant, k (Min. x %)-1	Structure Factor E at 600 P.S.I.
X-289	Oct., 1946	13.0	0.000249	138
X-289 X-346	Jan., 1947 Jan., 1947	12.1 10.9	0.000239 0.000265	138 135
X-346 X-387	July, 1947	11.0	0.000247	130
*7-301	July, 1947	11.0	0.000234	136

Summary and Conclusions

Measurements of elongation of rubber vulcanizates at a fixed stress have been made with a precision much greater than can be obtained in the usual measurements of stress at a specified elongation. Such measurements form the basis of a strain test developed to characterize rubber vulcanizates in control and research testing. Statistical analyses show that the errors introduced in the actual strain measurements are negligible compared to those introduced by variations during compounding and curing; whereas the errors introduced by the usual measurements of stress at a specified elongation are of the same order of magnitude as those for compounding and curing. The high precision of strain testing has been used to detect variations within a single sheet of vulcanized rubber and variations among sheets cured from the same compounded batch. It has also been possible to determine with a single sheet its change in stiffness or modulus with age. The uniform treatment of specimens in the strain test makes them particularly useful for precise measurements of set. Further, it has been found that the decrease in elongation with time of cure apparently follows the laws of a second-order chemical reaction; consequently it is possible to represent the data by an equation, involving three vulcanization parameters.

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Oxidative Degradation

(Continued from page 364)

From studies' of a number of synthetic rubbers it appears that carbon-carbon double bonds along the chain and pendant vinvl side groups enhance the rate of both cross-linking and scission, favoring the former. Methyl side groups enhance the rate of scission very markedly. Many negative side groups seem to retard both scission and cross-linking. For example, cross-linked polystyrene, ethyl acrylate rubbers, and polyester rubbers are very resistant to scission and cross-linking at high temperatures as measured by continuous and intermittent stress relaxation.

Mesrobian, Tobolsky, J. Polymer Sci., 2, 463 (1947).

Aging of GR-S

(Continued from page 366)

ing, were subject to two separate and distinct aging factors: a light-energized oxidation and attack by ozone. In a later paper (23) these workers described an accelerated ozone weathering test. It was pointed out that it is necessary to separate the two factors, light-energized oxidation and attack by ozone, before attempting to evaluate the aging properties of a compound.

LIGHT AGING. The effect of light on GR-S has already been discussed. Crabtree and Kemp (4) described a device for accelerated weathering studies which, it is claimed, meets the more fundamental requirements of natural aging. Morris, Hollister, Barrett, and Werkenthin (24) developed an accelerated light aging method and applied it to pure Hevea stocks and loaded GR-S stocks. These workers were able to correlate the results of accelerated and sunlight aging in the case of natural rubber when precautions were taken to cool the specimens during aging. No correlation was obtained, how-

ever, in the case of GR-S stocks.

Stress Relaxation. The set and stress relaxation measured by Tobolsky and coworkers (22) include both reversible and irreversible changes. If a measure of only the irreversible change could be made, it would provide the basis of a test method for aging natural rubber, GR-S, and other synthetic rubbers.

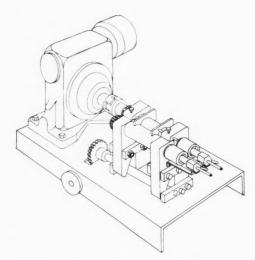
Oxygen Absorption. Shelton and Winn (2) obtrined good correlation between oxygen absorption and change in physical properties for GR-S, and in view of what has been said already concerning the importance of oxidation in the aging of both natural rubber and GR-S this appears to be the most promising chemical method for evaluation of aging properties.

The usefulness and limitations of tests for aging are

(Continued on next page)

A Small Laboratory Rubber Mill'

G. Goldfinger, H. Kirkpatrick, G. Oakley, and D. Paige



Improved Rubber Mill for Laboratories

■ HE size and the capacity of two-roll mills available in the laboratory often pose a serious problem when smaller than usual samples of rubber must be compounded. For example, in separating a given elastomer into fractions of different molecular weights it is quite often impossible to obtain samples weighing as much as a gram.

In order to be able to compound samples of rubber weighing one gram or less, a very small rubber mill has been constructed. This mill has rolls 11/2 inches by four inches driven by a 1/2 h.p. motor and is shown in the accompanying illustration. Samples weighing between 0.25-gram and five grams can be readily compounded, and with some difficulty (adding the curing ingredients from a masterbatch) samples as small as 0.1-gram can be handled. The upper limit of capacity of the mill is 10 grams.

The back roll of the mill is held by two steel supports which are firmly attached to the base plate. The motor drives the back roll from the left. Two pivoting supports, which are hinged approximately halfway between the roll and the base plate, hold the front roll. An eccentric steel rod is supported close above the base plate in such a manner that it presses from behind against the support of the front roll. This eccentric rod can be rotated with the aid of a knob which drives a wormgear arrangement and thus the distance between the rolls can be regulated. The rolls may be heated or cooled by circulating steam, water or any non-corrosive liquid through them, and they move in permanently lubricated bronze bearings. Two aluminum guides, which can be set in any position along the rolls, are provided, and the mill has a magnetic brake that can be operated by either a hand-or foot-switch.

The relative speed of the rolls is 1/1.25, but by changing the gears considerable range of relative roll speeds may be obtained.

Department of Chemistry, University of Buffalo, Buffalo, N. Y.

A thin glass plate has proved to be the most suitable mill "pan.

The mill was constructed with the help of a Frederick Gardner Cottrell Special Grant-in-Aid of Postwar Scientific Research, for which the authors are deeply

This new small laboratory mill is available through I. Sorvall, Inc., 210 Fifth Ave., New York, N. Y.

Aging of GR-S

(Concluded from page 371)

discussed by Buist and Welding (25), who emphasize that it is important to distinguish between the different changes included in the term aging.

Summary and Conclusions

In summary, at least two laboratory tests are required to determine the aging characteristics of GR-S and natural rubber, one based on deterioration caused by ozone and another on the deterioration due to oxygen. In both tests consideration must be given to the effect of light and temperature.

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United States Motor Vehicle Factory Sales

(Number of Vehicles)

	Passenger Cars	Motor Trucks	Motor Coaches	Total
1946—First three months 1947—First three months 1948—January Pebruary March	199,864 815,145 305,081 274,847 349,998	117,692 323,094 99,200 107,054 140,606	1,259 3,997 1,370 1,090 1,409	318,915 1,142,236 405,651 382,991 492,013
First three months	929.926	346.860	3.869	1.280,655

Source: Automobile Manufacturers Association.

EDITORIALS

Government Rubber Policy a Continuing Responsibility of the Industry

THE Rubber Manufacturers Association, Inc., and one of this country's leading rubber industry executives have recently called attention to the fact that, although the Rubber Act of 1948 is now law, the industry has a continuing responsibility to see that the interpretation and administration of the Act are properly and speedily accomplished. This point cannot be emphasized too strongly.

The policy statement which asserts that "the security interests of the United States can and will be best served by the development within the United States of a free, competitive synthetic rubber industry" is of paramount importance as a guide in relaxing controls and in the disposal of government facilities in excess of the basic security block of plants. It is believed that the policy statement will discourage the government from any arbitrary use of the broad authorities granted by the Act, but it will be necessary for the industry to follow the administration of the law closely and to avoid a complacent attitude with regard to the interpretation of its provisions.

The way in which a liberal as compared with a narrow interpretation of the policy statement might be important to the development of the synthetic rubber industry in the United States is stressed by the R.M.A. in connection with the definition of "rated production capacity" of the synthetic rubber plants in Section 18 of the Rubber Act. If this capacity is taken as that assigned at the time of authorization of construction, there will be no plants from the basic security block available for disposal; while if capacity is taken from actual operating records, facilities having an annual capacity of 120,000 long tons a year of GR-S might be available for disposal.

Also in connection with Section 9, the government is directed to undertake an immediate study of the disposal problem and formulate a plan for disposition by sale or lease to private industry by April 1, 1949. The R.M.A. suggests that all members of the rubber manufacturing industry holding constructive views should offer them for guidance of the officials who will be charged with developing this disposal plan for Congress, and in this suggestion we most heartily concur.

The Act instructs the government to terminate the patent pooling agreement of December 19, 1941, and while Congress cannot constitutionally abrogate the patent pooling and cross-licensing agreements, the government can achieve the dissolution of these agreements by mutual consent of all parties to the contracts. As John L. Collyer, president of The B. F. Goodrich Co., has also recently pointed out, such a move would at once return

the full power of competitive research and development to the improvement of existing rubbers and the invention of new, better, and lower cost rubbers.

In addition Mr. Collyer recommended that the United States exert its influence toward the maintenance of a free world market in rubber and against the resumption of cartels or other programs that would restrict the production of natural rubber, encouraging, instead, greater research efforts toward improving quality and attaining greater uniformity in grades in the natural rubber field. All of this would be in the interest of permitting more rapid stockpile accumulation and the development of an economically sound and competitive natural rubber industry. Somewhat similar suggestions with regard to the necessity of improving and servicing natural rubber were presented in this column last month.

The question of the resumption of commodity agreements or other programs that would restrict the production and distribution of natural rubber is actively being considered at high levels according to the report of the recent Rubber Study Group meeting in Washington. It was stated that "the Group reached the conclusion that the time had not arrived for any consideration or examination of a commodity agreement." In the opinion of India Rubber World it would be best if further discussion of commodity agreements be abandoned, and that except for security considerations a free market for all rubber should be the ultimate goal. It is apparent that the rubber goods industry will have to remain alert to forestall developments in the wrong direction here

On a wide range of subjects, therefore, there is still need of the rubber industry in the United States to scrutinize closely the actions of its own and other governments and to register promptly approval or disapproval, as required. It is only in this manner that the industry can protect and maintain the progress it has achieved in the last several years.

A Commemorative Goodyear Stamp

WE HAVE been reminded that the 150th anniversary of the birth of Charles Goodyear, the discoverer of the vulcanization of rubber, will occur on December 29, 1950, and that this would be a fitting time to honor Goodyear with a commemorative stamp.

The Rubber City Stamp Club, of Akron, O., has initiated a campaign to have such a stamp included in the series of postage stamps which portray famous Americans. The Postoffice Department has promised to consider issuing the Goodyear stamp and it would seem that this project should receive the support of The Rubber Manufacturers Association, Inc., and such professional and scientific groups as the Division of Rubber Chemistry of the American Chemical Society. The country should indeed honor a man whose discoveries were the basis for such an important national industry.

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DEPARTMENT OF PLASTICS TECHNOLOGY

Mycalex 410 - Glass-Bonded Mica in Molded Form

MYCALEX 410 is the standard molded composition produced by the Mycalex Corp. of America in pro-cesses similar to transfer molding. Generically, Mycalex 410 belongs to the class of ceramic materials known as glassbonded mica which may, in a different sense, also be described as mica-filled glass. Thus Mycalex is a ceramic consisting of fine particles of mica dispersed in a matrix of low melting glass.

The presence of a substantial percentage of mica in highly divided form results in an improvement over the electrical properties of glass alone. The mica also introduces desirable discontinuities in the vitreous structure of the glass. These discontinuities to a large extent overcome the brittle characteristics of glass by providing stress relief and creating a crack-stopping feature which increases resistance to both thermal and

mechanical shock.

The dispersion of mica results in a material having a cellular form in which the walls of the mica-filled cells are the intervening thin films of glass. With this basic picture of the manner in which the glass and the mica are physically com-bined, it should be apparent that control of the composition and the form of both the glass and the mica is an additional factor essential to the quality of the ultimate product. Furthermore, combination of the glass and the mica in the proper proportions and under the proper molding conditions is indispensable to the achievement of the desired properties in a completed molded part.

Molding Technique

Mycalex 410 in molded form can be produced in a wide variety of shapes and sizes, generally comparable with the forms which can be produced by the transfer molding of phenolic composi-tions. The inorganic nature of Mycalex distinguishes it, however, from any of the materials available in the plastics

Powdered mica and powdered glass of special composition are intimately mixed together to make the raw material of the process. This molding powder is then preformed into loose pellets or large biscuits, depending upon the size of the part to be made. The preforms are prepared for molding by heating in gas-fired furnace to approximately 1.200° F. At this temperature the glass is fluid and wets the mica particles to form the basis for a strongly cohesive body after completion of molding.

The procedure of custom molding requires a properly constructed injection mold made of high-temperature steel. The heated preform is placed into the transfer pot of the mold and is forced by the travel of a hydraulically operated

plunger to flow through runners and gates into the mold cavities. Since the mold is operated at a temperature below the softening point of the glass, the Mycalex in the mold cavities solidifies. permitting the mold to be opened and the part to be removed. In greater detail, the operation consists of cleaning the mold cavity with a blast of air, applying a parting fluid by spraying, clos-ing the mold by operation of the clamping ram, inserting the heated preform into the transfer pot, transferring the material from the transfer pot into the mold cavity by operation of the transfer ram, soliditying the molded piece by a sufficient dwell period, and finally re-moving the finished part from the mold cavity by the automatic operation of knock-out pins as the mold opens.

Molded Mycalex 410 is unique among moldable materials in having a coefficient of thermal expansion very closely matching that of the steel used in mold cavities. This permits a far higher degree of precision in molding than is obtainable with any other molded material. In all practical cases the mold cavities are machined to the precision required in the final product. After successive stages of hardening, polishing, and plating, the mold cavities in the completed mold are heated by gas firing to the required molding temperature in the re-gion of 700° F. The molded parts taken from these cavities then in turn retrace the thermal expansion of the mold in the process of cooling to room temperature, duplicating with exact precision the dimensions originally machined into the mold.

Unlike organic plastics, the shape and size of a molded Mycalex part is permanent after removal from the mold. There is no progressive chemical change upon aging that will affect the dimensions of the part. Furthermore, Mycalex contains none of the plasticizer common to organic plastics which frequently causes serious shrinkage in dimensions over a period of time as the plasticizer volatilizes. As a further guarantee of dimensional stability. Mycatex is im-pervious to oil and moisture, and as it has a low temperature coefficient ap-proximating that of steel, there is practically no normal atmospheric variation in any part of the world which will affect its serviceability.

Design of Molded Parts

The design of molded Mycalex parts has much in common with the design of parts cast or molded from other rigid materials. Since the parts are made by filling a metallic cavity, they must be designed not only for the required performance, but also for removal from the mold after hardening. This requirement means that undercuts are permissible only when parallel to the direction of removal from the cavity unless special action is built into the mold. TransF. L. Yerzley²

verse undercuts can be achieved by the use of side rams or wedges, but these complicate both the mold construction and the molding cycle. The resultant slower operation and additional me-chanical details for maintenance result in higher unit cost for such molded

Some taper is necessary on all surfaces perpendicular to the parting line of the mold. Nominally a two-degree taper is good general practice, but frequently a much larger taper is used. There are other instances permitting smaller angular drafts than two degrees, but seldom less than one degree and then only with the most careful opera-tion and maintenance of the mold in combination with the most favorable arrangement for knockout.

Use of Inserts

Whenever it is desirable to use integral threaded fastenings for the mounting of Mycalex parts or to secure commg of Mycalex parts of to secure com-ponents on such a part, the best arrange-ment is to use threaded metal inserts molded into the Mycalex. An important consideration in the design of the loca-tion and shape of these inserts is to make provision to block the flow of Mycalex into the threads of the insert during the injection phase of the cycle. This blocking is usually done by providing a blocking area between the edge of the Mycalex at the insert and the beginning of the threads. This will normally take the form of a boss or unthreaded shank on the insert which fits accurately into a recess in the mold

Not only does the particular coefficient of thermal expansion of Mycalex serve an all-important purpose in the molding process as earlier described, but it also plays an equally important part in rela-tion to the inclusion of inserts. The equality of the thermal coefficient of expansion with that of soft steel brings about a natural combination with that metal. Where metal inserts are required for fastening purposes or for added strength, soft steel is likely to provide the most satisfactory and economical parts. If, however, other properties are required, such as absence of magnetic effects, high electrical conductivity, resistance to corrosion, or ability to take solder, any one of several ferrous and non-ferrous alloys can be used.

Some provision is always made in the design of metal inserts to give a positive mechanical interlock or anchorage between the inserts and the Mycalex. In general, inserts are of two classes: those which are surrounded by Mycalex, and those which surround the body of Mycalex. Inserts of the first class are most frequently round pins produced on screw

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 Director of research and engineering, Mycalex Corp. of America, Clifton, N. J.

machines. Anchorage for such parts is usually provided either by knurling a portion of the surface to be surrounded by Mycalex or by provision of one or more circumferential grooves.

Knurling is satisfactory with all metals where a tight mechanical interlock is the primary requirement for inserts sur-rounded by Mycalex. It is not generally sufficient where a tight seal against oil, moisture, or air is required of the as-sembly and where relative expansion coefficients must be taken into full account. The best procedure generally is match the expansion coefficient of Mycalex as closely as possible over the range from room temperature to 700° F. For Mycalex 410 this expansion coefficient is 58 x 10-7 per °F. This expansion coefficient is closely matched by 18-8 stainless steel and by 28% chrome iron. Most other metals commonly used for inserts have higher expansion co-efficients; these would be Monel, nickel, copper, 65-35 brass, and aluminum, in the order of increasing expansion co-efficients. Contraction in the diameter of metal inserts relative to Mycalex during cooling from the mold temperature would result in development of paths for leakage. To prevent this development circumferential grooves are em-ployed on the insert. By this device longitudinal contraction of the insert applies pressure between the shoulder of the grooves and the Mycalex molded into it, and a tight seal may be developed as the result.

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For inserts of the second class, those surrounding a body of Mycalex, a somewhat higher coefficient of expansion relative to Mycalex is desirable. Nickel and Monel, and stainless steel to a lesser degree, would thus contract around the Mycalex upon cooling to exert a positive radial pressure on the Mycalex. In the case of external inserts of this class, some knurling or mechanical interlock is desirable to reinforce the strength of the metal-to-Mycalex combination.

Since Mycalex during injection into the mold cavity may be as hot as 1.200° F., and because forces of considerable magnitude occur during its flow, the mechanical properties of the inserts at elevated temperatures must be considered. Monel, nickel, and ferrous alloys are generally entirely practical at molding generally entirely practical at moiding temperatures. Copper and aluminum al-loys may prove troublesome under some conditions. Brass of 65-35 composition can be used under all but extreme con-ditions, but lead-bearing brasses may be excessively brittle at molding tempera-tures. Aluminum and its alloys may be molded where the insert itself is not sufficiently exposed directly to the Mycalex during the molding cycle to attain a temperature where softening or melting would occur. Copper and silver may be used with caution in design.

Surface Finish of Molded Parts

The surface finish of molded Mycalex parts may range from a very smooth surface with high gloss to a relatively dull surface, depending upon the particular conditions prevailing during the molding process. The highest finish is molding process. The highest finish is ordinarily obtained in the molding of smaller pieces near the higher limit of permissible mold temperatures and pres-sures and when the glass content is high in comparison with the mica. On the other hand, if the piece is large, it is desirable to use a somewhat lower mold temperature in order to shorten the molding cycle for economic reasons.

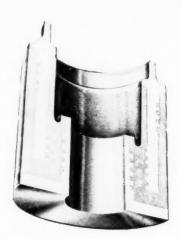


Fig. 1. Section through Heavy Mycalex 410 Bushing with Stainless Steel Inserts Used in High-Voltage Mercury-Filled Tube

Annegling

A further consideration related to the size of the molded piece is the necessity of properly annealing the part. This is seldom a matter of any difficulty if the parts are small, but it becomes increasingly important as the bulk and crosssection of the molded parts increase. The annealing procedure generally em-ployed for small parts is to transfer them from the surface of the mold after ejection to an annealing oven located immediately adjacent to the press. In other cases parts are annealed by running them through a horizontal furnace operating at the desired temperature gradient with a predetermined belt speed. If the parts have sufficient bulk to maintain their temperature over a period of hours in an insulating medium, annealing may be accomplished by dropping the parts into a barrel of Silocel or equivalent diatomaceous material.

Use of Soldered Connections

There are two methods of making soldered connections to Mycalex. The first is the inclusion in the Mycalex of inserts made of metals which will take solder, such as Monel, brass, or silver. The usual procedure of tinning or preparing the surface before the molding operation is not always applicable to inserts for molded Mycalex parts because the high temperature of the molding operation may cause excessive oxidation of the surface of the insert. Neither does it seem entirely feasible to acidclean the inserts after molding because the chemicals involved are too strong for the Mycalex. An electrolytic procedure may be used under controlled conditions where the oxide coating on the metal is relatively light and where the geometry of the parts permits this type of handling. The best procedure, although the most expensive, is to clean the surface mechanically prior to solder-

The second method of preparing Mycalex for soldering is to apply a suitable metallic film to the surface of the My-calex. This may take the form of a metallized paint containing a glass flux fused at the proper temperature. This procedure must be carefully controlled since glasses normally used in metallic paints fuse at a temperature approximating that, of the binder used in My-

calex. If the paint is fired at too high a temperature, the surface of the Mycalex will blister and become porous. If the firing is not sufficiently prolonged or is done at too low a temperature, the paint will not adhere. Metallic films have also been applied to Mycalex by spraying molten metal. The metallic coating is subsequently polished and tinned, and the soldering operation completed. It is desirable, when joining metal parts to Mycalex by this procedure, to select a metal for the adjoining part having a temperature expansion coefficient close to that of Mycalex. Copper plated or tin plated steel and stainless steel. Monel metal, and nickel may be used for this purpose.

Basic Properties

Many of the basic properties of My-calex 410 have been described in the preceding portions of this paper. For completeness, numerical values of certain key measurements should also be considered and are tabulated below:

Properties of Mycalex 410	
Electrical Power factor, one megacycle, dry Dielectric constant, one megacycle Volume resistivity, ohm-cm. Arc resistance, AS.T.M., seconds Lielectric strength, volts/mil	$\begin{array}{c} 0.0015 \\ 8.3 \\ 6.0 \times 1017 \\ 250 \\ 400 \end{array}$
Mechanical Flexural strength, p.s.i. Tensile strength, p.s.i. Compressive strength, p.s.i. Hardness, Brinell Modulus of elasticity, p.s.i.	6,000 20,000 150 8 x 106
Maximum safe operating temperature. °C. Density, lbs./cu. in. Specific gravity	400 0,136 3.8

Applications

The foregoing properties of Mycalex 410 and the other characteristics described throughout the paper have provided a practical answer to the following technical requirements in many applications:

- (1) Low dielectric loss.
- (2) High volume resistivity.
- (3) High dielectric strength. (4) High arc resistance.
- (5) Stability over wide humidity and temperature ranges.(6) Resistance to high tempera-
- (7) Mechanical precision and sta-
- (8) Mechanical strength.
- (9) Combination of insulation with
- metal inserts. (10) Minimum maintenance expense.

Mycalex 410 has been installed in equipment requiring combinations of properties which were not otherwise available, as follows:

(1) Mycalex 410 relay spacers requiring low cold flow, extremely close dimensional tolerances, high arc resistance, high volume and surface resistivity, and resistance to effects of temperature and humidity changes, including tropical conditions.

(2) Mycalex 410 insulation for a highvoltage mercury tube requiring high dielectric strength, mechanical strength, durability, and resistance to a tempera-ture of 300° C, used in processing the tube. A section through this insulating bushing with stainless steel inserts is shown in Figure 1. The part is 41/4 inches in outside diameter, 45% inches long, and weighs slightly more than eight pounds.

(3) Mycalex 410 mounting plate for

tuned current of a television receiver requiring high "Q" dielectric stability, fine silver inserts, and mechanical precision. This part is the small plate shown in Figure 2 and is 13\(\)a inches long and weighs approximately 1/5-ounce. The large plate shown in Figure 2 is a Mycalex 410 switch wafer for the tuning section of a television selector switch requiring low dielectric losses at high frequency, stability of loss factor and dielectric constant under all atmospheric conditions, dimensional precision, and high mechanical strength to withstand a riveting operation without excessive breakage. This piece is 134 inches long and weighs approximately \(\)2-ounce.

(4) Mycalex 410 tie-in point for electronic circuit requiring high dielectric strength, resistance to moisture, high resistance to ground, mechanical strength, and ability to withstand the temperature

of a soldering operation.

(5) Mycalex 410 insulation for a high-frequency test jack requiring precision molding with metal inserts, low dielectric losses, and stability under various atmospheric conditions. This part is shown in Figure 3. The central circuit is made of brass and the outside part is stainless steel. The overall length of the part is 34-inch, and it weighs approximately 1/5-ounce including the inserts.

(6) Mycalex 410 insulating rod for

(6) Mycalex 410 insulating rod for spring relays to actuate groups of contacts simultaneously. This part is required to be mechanically precise and flat on one side, and to show no warping or other distortion over a period of time and under a variety of atmospheric conditions.

Compression Molding Materials

The preceding sections of this paper have dealt specifically with the design, production, and properties of insulators injection molded from Mycalex 410. The evolution of a compression molded material, Mycalex 400, is also of interest and has resulted in the availability of highly developed insulation in the form of sheets or slabs 14 by 18 inches in size and ranging in thickness from 18to one inch. Such material sold from stock is machined or fabricated to make parts which are essentially flat in form. Rods are made by centerless grinding of square bars cut from flat stock. All of the usual machining techniques are applicable to these sheets and rods, such as shaping, turning, cutting, drilling, and tapping.

Wherever possible, tungsten carbide tools should be used in conjunction with a generous supply of water for removal of chips and dust and for cooling and lubrication. Although the equipment and the tools used for fabrication are available in every well-equipped machine shop, the requirement of water lubrication and specialized experience recommend that fabrication be performed in production processes only by personnel which is skilled in fabrication by past

experience.

The development of high-frequency circuits has created a demand for dielectric materials having high dielectric constants. To meet a portion of this demand the Mycalex Corp. of America has developed a series of compositions ranging in dielectric constants from 10 to 80 at one megacycle per second. This range of dielectric constants is available both in compression molded and transfer molded materials. The specialized nature of these compositions is such, however, that they are available at the present time only on a custom-order basis or else for large-volume requirements.



Fig. 2. Mycalex 410 Mounting Plate and Switch Wafer Used in Tuning Section of a Television Receiver



Fig. 3. Low Loss Test Jack for Electronic Circuits with Mycalex 410 Body and inserts of Brass and Stainless Steel on the inside and the Outside, Respectively

Acknowledgments

The author takes pleasure in acknowledging the interest and cooperation of the Society of Plastics Engineers in arranging the presentation of this paper. He is also indebted to A. S. Backus, of the Mycalex Corp. of America, and to H. M. Richardson and A. J. Monack for suggestions and review of the text.

Hold Plastics Buyer Panel

THE first buyer panel in connection with the product evaluation program recently announced by Dow Chemical Co. Midland, Mich., met in Midland on May 4 together with technical and consumer groups associated with the program. The panel viewed the molding of plastic articles in experimental molding laboratories and during the balance of the morning sat in joint session with Dow's product evaluation committee after witnessing many of the tests to which products are subjected during evaluation. Some 50 different products were considered with regard to design, color, and salability.

This meeting was part of a six-point

program recently instituted by Dow to upgrade the quality of products made from its plastics, especially Styron, which has particularly widespread use in consumer products. The program includes technical evaluation of all plastic products produced by molders using Styron, consumer panels which test the products under actual use conditions, and revolving panels of buyers meeting in large buying areas throughout the country. The program is backed up with national consumer advertising by Dow from which the molder and the merchandiser benefit, direct mail merchandising, check lists on new products for buyers' use, and consumer education. All evaluated products which pass the technical tests may bear a special Styron label to identify them to consumers as being technically correct in design and function.

Geon Polyblend Latex

GEOX polyblend la.ex, a new waterborne plastic which should prove particularly useful in the decorative coating and film fields, has been announced by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. The material is a coloidal blend of Geon polyvinyl chloride and Hycar nitrile rubber and is supplied as a mechanically stable liquid containing 45-50% solids and with a specific

gravity of 1.08.

The latex dries at room temperature to a tough, wa er-white film possessing excellent greaseproofing qualities. The film has a tear resistance of 1,000 lbs./in., a tensile strength of 2,000 p.s.i., and an elongation of 350°. A 10-minute fusion at 300° F. will raise the tensile strength to 3,500-4,000 p.s.i. and the elongation to 000-700°/c, but will lower the tear strength by about 20°/c. The film will heat seal at 280° F., is tasteless and non-toxic, and has good low temperature flexibility, being flexible at —50° F. The very slight odor in the cast film disappears upon fusion.

A two-mil thick film has a moisture vapor transmission of 6-8 grams per 100 square inch in 24 hours. While too great for cheese, this transmission rate is ideal for oleomargarine and meats because it allows normal "breathing." This transmission rate combined with its good low-temperature properties should make the latex film excellent for packaging frozen foods. The film's dielectric strength of approximately 800 volts per mil opens up possibilities in the electrical field.

The latex coating is very glossy, and this gloss is maintained even under high loadings. The heat stability is good, and the greaseproofness is not impaired even when the film is flexed at very low temperatures, it is further claimed. A paper coated with the latex will show a 10% greater Mullen burst pressure and a 100% improvement in tear resistance. When tested face to face, the coating will not block below 10% F., and at normal temperatures the surface is completely tackfree. The first coating on paper will dry almost instantaneously, but the drying rates of subsequent coats depend on the ambient temperature and humidity.

In addition to purely decorative coatings, other possible uses for latex coated paper and boxboard are packagings for bread, doughnuts, and other greasy pastries, gum and candy wrappings, cigarette packages, and cardboard milk containers. The material is presently available only in sample quantities, but will be ready for commercial marketing within a few months.

Styrene Polymers and Copolymers for Industry

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THE almost phenomenal growth in the production, sale, and application of polystyrene has focused the attention of plastics engineers on this thermoplastic, as never before. Likewise research laboratories throughout this country and abroad, aware of the importance of styrene, have devoted intensive effort to the study and application of styrene polymers and copolymers. In trying to analyze the reasons for this tremendous growth and interest in styrene, two basic factors: namely, cost and properties, seem to be of paramount significance. The outstanding properties significance. The outstanding properties and also the deficiencies of polystyrene are sufficiently well known as not to require detailed elucidation. The remarkable in-crease in our production capacity for styrene monomer in connection with the synthetic rubber program and for other purposes is an old story. The fact remains, however, that owing to this expansion we have available in this country facilities for producing and selling tremendous quantities of styrene monomer at approximately 13c a pound, and crystal styrene molding powder at a low figure. Because of this low cost polystyrene at present seems to have the low-priced field for injection molding thermoplastics fairly well in hand. This condition is reflected, for example, in the fact that a great many molding jobs previously using other materials are being swung to polystyrene primarily because of cost although, naturally, the resin properties must also be adequate. Apart from the influence of polystyrene in the molding field, research and development work on styrene polymers and co-polymers have implications which are per-

A primary objective of this work has been to provide industry with styrene resins of improved usefulness by developing materials with a wider range of properties and consequent greater versatility of application. This objective should be of interest not only to molders, but to many other users of resinous materials, since many of the newer applications represent a powerful threat to older materials which, in spite of years of established use in particular fields, are not invulnerable. Assuming that these new materials derived from styrene possess the necessary properties, the power behind this threat stems directly from the low cost of styrene monomer. It is not at all impossible, therefore, that the impact of these resins will be strongly felt in the surface coating field, in adhesives, in textile and leather treating, in the paper and packaging industries, and in synthetic fibers and bristles. These are but a few of the industries where already the encroachment of styrene products is beginning to be felt, and many other fields of application are well within

haps even more far-reaching.

the realm of possibility. It is the purpose, then, of this paper to attempt to summarize advances of interest that have been made in the field of styrene polymers and copolymers and to give some idea of the principal tools which are available for tackling the problem. It is hoped that a presentation of this kind will contribute in a small way to a better un-derstanding of polystyrene and its copoly-

mers, and that some insight will be gained into the possible avenues of attack open to these potentially low-priced materials.

Polymerization of Styrene

At the outset it seems logical to define—for the benefit of those not familiar with the field—what is meant by the terms "polymer" and "copolymer." It is well known that there are a number of organic liquids, such as styrene, methyl methacrylate, and vinyl acetate, which upon heating become more and more viscous and upon continued heating are finally converted to solid resins. This process is called "polymerization" and is attributed to the fact that these compounds contain double bonds; that is, they have two arms which are capable of joining hands to form long chains when heated. The polystyrene chain contains only styrene units and is a true polymer. If, however, the chain were formed from two chemicals, the process would be analogous to "co-polymerization" and the product would be termed a "copolymer." Applying this analogy to styrene and methyl methacrylate, if these liquid monomers are mixed and then polymerized by heat, the copolymer chains contain both styrene and methyl methacrylate units as individual links. A true copolymer, therefore, always contains both units in its chain and is never a mixture of the pure individual polymers. It will be apparent that the polymerizing mixture is not necessarily limited to two monomeric consituents, but may contain three or more components. The principle of copolymerization thus offers almost limitless possibilities and has proved to be a useful research tool for the preparation of new resins with valuable properties.

The polymerization of styrene monomer or its copolymerization with other monomers may be carried out by any one of four principal methods: mass polymerization, solution polymerization, suspension polymerization, and emulsion polymeriza-tion. A great deal of the fundamental polymer research both here and abroad has been concerned with the elucidation of the basic principles underlying each of the above methods of polymerization. As a result of this work and through the application of the principles discovered, it has been possible to continue to improve the quality of the styrene polymers and co-polymers offered to industry. While a de-tailed discussion of these various polymerization methods is not possible here, it will be apparent that they represent powerful aids in the never-ending search for improved plastics and for new resins. Each method has its particular advantages and disadvantages, and the correct choice and application of polymerization technique often have a great effect upon the prop-

The foregoing gives a general idea of the means by which the properties of known resins may be improved and new resins prepared. What success has been attained with styrene and with its copolymers by following these approaches?

Effect of Polymerization on Properties

The outstanding properties of polystyrene are familiar and include excellent electrical characteristics, low moisture absorption, excellent clarity, chemical resistance, and others. To the research worker these excellent characterisics and the low cost of the material represent a challenge to produce polystyrene having a still Reid G. Fordyce²

greater range of useful properties so that molders and other users of plastic mate-rials can utilize polystyrene in still wider fields of application.

It was soon found in this work that certain inherent properties of polystyrene remained essentially constant regardless of the method of preparation. Thus electrical characteristics, water absorption, chemical resistance (to acids and alkalies), refractive index, specific gravity, and heat conductivity remained essentially the same regardless of how the sample was prepared.

It was also found, however, that other properties, such as softening point, could be changed considerably by controlling the length of the polymer chains referred to previously. Thus when the average chain length dropped below about 240 styrene units, a marked decrease in softening point occurred. Therefore by controlling chain length a series of polystyrene resins can be offered to industry having melting points between 100-230° C. (A.S.T.M. E 28-42T).

It was found, too, that the solubility characteristics of polystyrene could be al-tered, depending on polymerization conditions, to prepare polystyrene samples sol-uble in drying oils. Developments along this line could be an entering wedge into the surface coating field.

Strength characteristics depend to a great extent on the average length of the polymer chains, and it was found that when less than about 425 monomer units were in the chain, the mechanical strength properties decreased sharply. This state-ment does not mean that by building very long chains the strength could be improved indefinitely, for if the average chain length is greater than about 750 units, the injection moldabiliy is poor. Moreover the in-crease in strength achieved by producing very long chains is relatively small. It is interesting to note in this connection that the research worker is plagued by exactly the same difficulties that beset the molder. In determining strength values in such studies, it is necessary to test specimens molded under optimum conditions if the data are to mean anything. It is sometimes quite a problem to obtain such specimens. Likewise, the molder does not develop the properties given on the data sheet unless his moldings are produced under the proper molding conditions.

Another very practical benefit arising from new polymerization methods is the improved behavior with respect to crazing of modern polystyrene compared with earlier materials.

Effect of Fabrication on Properties

Quite apart from the method of preparation, the properties of polystyrene can be changed to produce more useful products by special fabrication techniques. As pointed out in the excellent paper by Mr. James Bailey,³ the extrusion and stretching pro-Bailey, the extrusion and stretching pro-cess developed by the Plax Corp. has given industry polystyrene films of re-markable flexibility and toughness. This orientation process has also been applied in one dimension to the production of fine-denier oriented polystyrene filaments showing an elongation as high as 100%. In both cases principal credit is due to the fabricator rather than the producer of the polymer in developing the improved properties. It will be apparent from the

¹ Presented before annual conference, Society of Plastics Engineers, Inc., Detroit, Mich., Jan. 21,

Plastics Engineers, Inc., Detroit, Mich., Jan. 21, 1948.

Plastics division, Monsanto Chemical Co., Springfield, Mass,

""Stretch Orientation of Polystyrene and Its Interesting Results," India RUBBER WORLD, 118, 225 (1948).

nature of the above fabrication methods that, unfortunately, definite limitations are imposed upon the possible size and shape of such flexible polystyrene materials. Nevertheless because of cost, properties, and amenability to such processes, styrene and styrene copolymers are knocking on the door for film, sheet, and fiber applications previously held sacred to older materials.

Available Forms

Another improvement in polystyrene polymers for industry is based not on an improvement in properties, but rather on the physical form in which it is available. Thus plasticized and unplasticized polystyrene emulsions, wherein the resin particles are very small (of the order of micron in diameter), have been offered to industry. There appear to be several applications wherein such resin dispersions are peculiarly well suited, and these dispersions have increased the usefulness of polystyrene just as surely as if its impact strength had been doubled. It is too early to define precisely what niche these emul-sions will find. Preliminary indications, sions will find. Preliminary indications, however, have been obtained of possible use in conjunction with fibrous products and in special surface coating jobs. Here again low cost is a decisive factor.

Of particular interest to injection molders is the product Lustrex. a polymer of styrene, based on the application of certain of the general principles mentioned above. This injection moldable product offers the outstanding characteristics of polystyrene plus greater heat resistance than any previous commercial polystyrene commercial

Styrene Copolymers

Considering now the field of polystyrene copolymers, it is readily seen from the myriad patents alone that a tremendous amount of work has been done in this field. Out of all this, the rather startling fact emerges that for copolymers in which styrene is the major constituent the principal successes so far have been obtained along two lines; either the heat resistance has been improved, or the solubility characteristics have been altered. Other properties of polystyrene have, of course, been altered by copolymerization, but, unfortunately, the change is sometimes in the wrong direction.

In the field of injection moldable, heat resistant styrene copolymers the first product historically to find commercial appli-cation was Cerex.⁴ This styrene copolymer, developed during the war, had sufficient heat resistance to withstand prolonged exposure to boiling water and had electrical characteristics only slightly inferior to polystyrene. Owing to unfavorable economics, however, the material was produced only in limited quantities and will be superseded by a new product, Cerex X-250, which is now being actively developed. This fully injection-moldable styrene copolymer has heat resistance equivalent to old Cerex, has good color, and has electrical characteristics essentially equal to that of polystyrene.

Another contribution to the field of heat resistant styrene copolymers for industry is Plexene M-47, developed by Rohm & Haas Co. This material is fully moldable and has found a number of industrial uses.

Reference should be made to the polymers of dichlorostyrenes developed during the war. These heat resistant polymers are examples of what can be done not by copolymerization, but by altering the styrene monomer unit itself. Products of this

type are being made by the Mathieson Alkali Works.

Inasmuch as the unfavorable economics of the Cerex mentioned previously appear to be a contradiction to the general thesis of these remarks, it might be well to amplify this case. This material, a styrene plify this case. copolymer, showed valuable properties over and above those of polystyrene, yet was too expensive to justify commercial exploitation. The difficulty is not attributable to styrene monomer cost, but rather to the high cost of the other component used in preparing the copolymer. It is almost self-evident that in considering any of the heat resistant copolymers mentioned above, or any other styrene copolymers, enthusiasm with respect to improved properties should always be tempered with the realization that the cost of the second component is of vital importance. If the cost is too high, one of the principal reasons for working with styrene monomer is automatically vitiated.

It has been found that by copolymerizing styrene with acids such as acrylic and methacrylic it is possible to produce products which are soluble in dilute alkali. This example is an effective one of a radical change in styrene solubility characteristics through copolymerization. These water-susceptible materials may be of interest as additives to textiles, paper, leather, surface coatings, and adhesives. Because these products are based on cheap styrene, it would seem likely that they may be available to these industries at an attractive figure. Quite apart from these acid copolymers, a number of other soluble styrene copolymers are known whose solubility characteristics are quite different from polystyrene. As yet none of these is in commercial production.

The solubility of styrene can also be radically changed by copolymerization with cross-linking agents. A cross-linking agent is a material capable of linking the long polymer chains together very much like the cord in a venetian blind holds the slats together. In general, such cross-linked copolymers are insoluble in organic solvents, are difficult if not impossible to mold, and show improved heat resistance. A styrene copolymer of this general type, Textolite 1421, was produced in limited quantities during the war by Electric Co. For certain critical electrical applications this resin does an excellent job. Also of interest in the field of cross-linked resins are several of the polyester low-pressure laminating resins in which styrene monomer serves, in a sense, as the cross-linking agent. The numerous wartime and projected peacetime applications of these styrene copolymers are well known and need no further elucidation Again, styrene monomer was a logical choice here because of its low cost. Related to the field of cross-linked sty

Related to the field of cross-linked styrene copolymers is the interesting research work being carried out in an attempt to combine the excellent characteristics of styrene with drying oils by means of copolymerization. The obvious technical and economic advantages for such a copolymer in the field of surface coatings have provided a powerful stimulus to the continuation of this work. A successful solution to this problem is certain to have an important influence upon the economics of this industry and upon the raw materials used.

There is little need to emphasize the vitally important role which GR-S ruber, a copolymer of butadiene and styrene, played during the war. Its importance may be judged from the profound effect which it still exerts on our chemical economy. It is also apparent that unless

styrene and butadiene were both low-cost materials, GR-S could not be an important factor in the rubber picture today. Close relatives of GR-S in the field of rubbery styrene copolymers are Dow's Styralloy and Dewey & Almy's Darex copolymers. The latter materials are of especial interest here because of their high styrene content. Unfortunately an adequate discussion of this class of styrene copolymers is beyond the scope of this presentation. Moreover certain of these copolymers are still in an early stage of development. The significant point with respect to properties, however, is that by the incorporation of butadiene through copolymerization, tough, resilient materials can be produced from styrene.

Having reviewed in a general way the advances that have been made in providing industry with improved styrene resins through copolymerization, it might be interesting to examine an outstanding failure. The problem is that of developing by copolymerization or by any other means a transparent, rigid, injection-moldable styrene resin having toughness and elongation characteristics equivalent to that of the cellulosic materials. This very obvious goal has so far defied attainment, but even here certain materials are appearing on the horizon, as Dow's Q475.5 resin, and indicate progress in this direction.

Summary and Conclusion

In conclusion, it will be apparent from this review of some of the advances made in the field of styrene polymers and copolymers that the methods of attack described earlier have been fruitful in providing industry with materials of increasing versatility of properties and improved quality. It will also be apparent that the cornerstone upon which practically all of these developments rest is the low cost of styrene monomer. The advent of lowcost styrene polymers and copolymers showing a wider range of properties provides a threat that is becoming increasingly apparent to older materials, both natural and synthetic, in a number of fields. Finally, lest the impression be gained that the main object of these developments is to undermine existing products, it should be stressed that perhaps the most important ultimate objective is the application of these syrene resins to uses which have not hitherto been possible for previously known materials.

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Saran Film Prices Reduced

CHEMICAL CO., Mich., has announced drastic price reductions on saran film. Donald L. Gibb, manager of Dow's plastics sales division. said the reductions applied to the type M and 517 films and would amount to approximately 25% in both cases. Made possible through expanded production facilities, the new lower prices are expected to provide many new markets for the films. Type M saran film is a war development of exceptional toughness, chemical resistance, and low moisture-vapor transmission which was extensively used for protection of machine guns and other precision materiel. Type 517 embodies these characteristics together with improvements which recommend its use in food packaging and as a general-purpose household film, including availability in lighter gages, ex-ceptional pliability, and an unusual "cling-ing" quality. Both films are available in widths up to 40 inches.

A product of Monsanto Chemical Co.

Some Recent Phases of Fabricating Technique

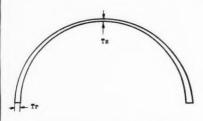


Fig. 1. Empirical Law of Thinning (Hemispherical Shape)

 $_{\Delta}T=$ Ks where "K" is thinning factor for the particular geometric shape. From practice "Ts" in full hemisphere is 30% of "Tr."

$$Tr = Ts + ? or Tr = \frac{Ts}{V}$$

EXAMPLE:
If 0.100-inch material is used and drawn to full hemisphere, assuming reduction from original thickness at edge where sheet is clamped of 15%

Ts

$$Tr = \frac{Ts}{K}$$
or
$$.100-.015 = \frac{Ts}{3}$$

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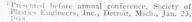
Ts = 0.028 thickness at apex of hemisphere.

THE success of any fabrication job is tied up intimately with the amount of ingenuity used in setting the final production plan. There is nothing really new about machining a plastic part, and the methods for forming are really adapta-tions of methods which have been known for years. However a thorough knowledge of the properties of the plastic materials is necessary in adapting these old processes to the fabrication of articles made of plastic sheets, rods, and tubes. The industry in the past has insisted upon rather broad dimensional tolerances and other limitations and, as a result, has educated the users of plastic parts to design their product so that these rather broad limits could be allowed. With customer standards now rising to a high plane and an increase in the number of applications, new techniques are being used. A greater amount of ingenuity must be used in the adoption of methods for forming than for machining because the operations of machining are on a more predictable plane. Much thought must be given to the method by which a part is formed, and it is with this point in mind that we discuss typical problems

Basically, a forming operation can be described in one of two ways: draping a warm piece of material over a form in single curvature, or stretching the material in several directions to accomplish the desired shape. Because there is nothing new to be said about drape forming at this time, we will take up the matter of stretch forming which can be done with combinations of several basic methods.

Stretch Forming

In the forming of a heavy section, which was to be used in construction of a transparent nose for a heavy bomber, a great deal of engineering and production thought had to be given to the proper thickness of material which, after the forming operation, would result in a section that fell



² President, Fabri-Form Co., Byesville, O.

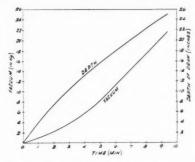


Fig. 2. Time-Pressure Curve Showing Rate of Draw

within the thickness tolerance set up by the designer. The finished shape of this nose had to be approximately parabolic, and this limited us to the use of a positive forming surface in order to establish the finished shape. The part could have been formed in a press with a male form and by the use of clamping rings, stretched much in the same manner as that by which a dishpan would be made, but we chose to use the vacuum snapback method instead because by that method we could maintain the best optics.

The designer called for a minimum thickness of 12-inch at the apex of the parabola and not more than a 34-inch thickness at the base. The finish depth of the parabolic section was 28½ inches, and the average diameter was 50 inches (this part was slightly eliptical at the base). From experience we knew the thinning due to forming would take place according to the pattern of a wedge (see Figure 1). Assuming a nominal thickness of 12-inch in the apex and 34-inch at the base, we equated the volume of material in this finished shape with the area of the disk within the confines of the clamping rings and arrived at a thickness for the sheet of about 1½ inches. Knowing that the designer wanted to maintain as nearly uniform a shell as possible, and that a sheet of this thickness would probably fall outside the limits given for both apex and base thicknesses, we decided upon a sheet which was cast 1½ inches thick in the center and tapered off to

about one inch at the edge.

The sheet was 56 inches in diameter, weighed in the neighborhood of 250 pounds, and presented a problem in handling. A special ring was made with clamps which would hold the disk in shape during heating and would allow for handling to the forming operation. It also became the upper clamping ring on the vacuum pot. Heat was applied in a hot air oven

Heat was applied in a hot air oven which had plenty of forced circulation. Because of the poor heat transfer properties of the methacrylate material and its tendency to harden with long exposures to temperatures of 325° F. in air, the oven was brought up from 150° F. to the forming temperature of about 325° F. over a period of three hours.

The opening of the vacuum pot had a

The opening of the vacuum pot had a 112-inch radius all the way around so that the thick methacrylate sheet would not tear from fiber stress because of the sharp bend, and the clamps were applied uniformly on the pressure ring to avoid strain concentrations at any point which might have caused tearing. Vacuum was drawn on the pot so as to stretch the

J. W. Knight²

sheet at a very slow rate, and we took 10 minutes to draw the sheet to a depth of 25 inches (see Figure 2). At this point the form was inserted and clamped in place, and the pressure in the pot was allowed to come up slowly over a period of about six minutes to allow the hot sheet to shrink back against the form (see Figure 3). Finally, with no vacuum on the pot and with the form clamped in place and the sheet shrunk back against the form, a period of 2½ hours cooling was allowed before the clamps were loosened on the ring. This cooling was done to prevent a crack through the flange because of hoop tension produced by natural shrinkage during cooling. The form, however, was held in clamped position for an additional 12 hours before we removed it. Provision for breaking the air lock between shell and form was made by installation of an air line to assist in removing the shell from the form. These were the major problems involved in production of

this nose.

In the production of a large aircraft canopy made of heavy heat resistant material we encountered a problem of springback in the forming operation because of its geometric shape. The same precautions had to be taken as in the previous problem because of the 34-inch thickness, but, because of its resistance, we had to work much faster in handling the sheet from the oven to the form. To overcome springback tendencies we had to blanket the exposed surface in order to assure uniform gooling.

Effect of Thinning

Thinning of the material is always a factor in drawing a part from flat sheet and must be taken into consideration in the beginning in order to adopt a method which will give the least amount of thinning. It is usually proper to design the dies so as to allow the greatest amount of slippage through the clamping rings and thereby provide the maximum amount of material from which to make the actual draw. Proper development of the blank does much to control the amount of material which will slip through the ring at any given point. In a complex shape, thinning will be greatest at the points of sharpest contour because of the drag of the material on the form at these points. It is often possible to eliminate excessive thinning by a combination of methods. For example, draw the sheet into a cavity which is much larger than the part to be produced and which does not necessarily have the same shape, insert the form in the cavity, and use compressed air or mechanical means to push the material tight against the form. By following this pro-cedure, the material is prestretched, and most of the drag which would take place by straight stretch method is eliminated.

To preserve the smooth surface finish of some parts which have complex shape, compressed air or vacuum is often used to force the sheet into the surface of the forming mandrel.

Ridge Forming

Ridge forming is useful where the object to be formed is of plain geometric design and where the surfaces are plane. In this case the die is composed of a

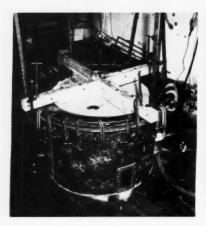


Fig. 3. Vacuum Forming Set-Up with Sheet Drawn Clamped and Form Clamped in Place

pressure ring to clamp the material and a skeleton of the part which contacts the material in forming only where necessary to produce shape. Variations of this are often used in combination with air pressure or with male or female dies to produce concave or convex surfaces.

Combinations of Forming Methods

Complex fabricated parts are gaining greater acceptance for industrial use, and along with this has come the interesting use of combinations of several basic methods into one operation. There are cases of fabricated parts incorporating undercuts which would have been impractical by molding methods. Various types of fastenening and frame work for mounting purposes are now being assembled as integral



Fig. 4. Brass Mounting Studs Being Assembled on Drain Tray

parts of fabricated units. For example, the brass studs used in mounting a drain tray on a drink dispenser were assembled by pressing the knurled brass stud into a small tab of the plastic material and then cementing the plastic tab to the main body of the part (see Figure 4).

body of the part (see Figure 4). Fiberglas cloth is coming to the front particularly in connection with aircraft canopy mountings. In this case the fiberglas cloth is laminated with the acrylic resins and cemented to the acrylic material in the canopy by the ordinary cementing means. This procedure has been adopted to accomplish bearing strength in the mounting portion of the canopy which is required to withstand the stress of cabin pressurization.

There are many potential uses for fabricated plastic parts, and their use is limited largely to the ability of the fabrica-

bus. The program calls for a dinner and a social period.

Vinyl Polymers for Metal Finishing

Approximately 30 members and guests attended a meeting of the SPE Rhode Island and Southeast Massachusetts Section on May 12 at the Providence Engineering Society Bldg., Providence, R. I. Speaker of the evening was Robert F. McTague, Stanley Chemical Co., who discussed "The Use of Vinyl Polymers for Metal Finishing."

Mr. McTague gave considerable information on the types of vinyl polymers both currently available and expected in the near future. These resins are characterized by being tasteless, odorless, non-toxic, permanently thermoplastic, and without acid numbers. These resins also are chemically resistant to many solvents, acids, and alkalies and form excellent bonds with nearly all metals or metal coatings, when properly compounded. A copolymer of 87% vinyl chloride and 13% vinyl acetate, with stabilizer added to prevent darkening, gives excellent adhesion to steel, iron, tin plate, and galvanized iron when baked at 250° F. This copolymer can be applied by brushing, or may be thinned with 12-15% toluol or xylol for spray application.

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Air-dried coatings were discussed in detail, with emphasis on "washed primers." These are polyvinyl butyral coatings containing small amounts of zinc chromate plus phosphoric acid; they give films 0.3-mil thick with excellent adhesion to steel, freshly galvanized iron, zinc nickel, cadmium, brass, copper, aluminum, magnesium, and chromium. The chief purpose of such a primer is to prevent "rust creep" under top coatings. The primer coating dries in a few minutes and adheres well to most top coatings.

For dipping, the speaker recommended vinyl polymer-based plastisofs and organisols. He displayed a wire dish drainer baving a white, flexible plastic coating obtained by dipping that he stated was superior to a rubber latex dipped coating in that it would not become soft or tacky in use. In similar applications, Mr. McTague said, plating racks with dipped vinyl coatings have withstood five months' continuous service in nickel and chromium plating baths.

The Section's previous meeting took place on April 14 at the Providence Engineering Society Bldg., with 65 members and guests attending. This session featured a talk by Michael M. Suba, wire and cable materials division, Bakelite Corp., on "Extrusion of Thermoplastics." Mr. Suba gave an interesting talk on the field of thermoplastic extrusion, with particular emphasis on the vinyls and polyethylenes and their application to wire covering, and he showed samples of the wide variety of wire coverings and other extrusion products which are available.

Plans of New Orleans Section

The New Orleans Section, SPE, held a dinner-meeting on May 6 at the New Orleans Hotel, with Section President Harold A. Levey, American Products Mig. Co., presiding, Following a brief business meeting, in which reports were heard from the different committees. John B. Molitor, Valite Corp., gave an excellent talk on "Finished Resins." The group decided to hold its next meeting, the last of the current season, on June 3. An outing is also being planned for July, with the date and site to be announced in the future. It is hoped that Mr. Molitor will be able to arrange for the outing to be held at the Valite Corp. plant in Lockport, La.

SPE Prize Paper Contest; Reports on Section Meetings

THE second annual prize paper contest has been announced by The Society of Plastics Engineers, Inc., through the national publications committee chairman, M. Scott Moulton, B. F. Goodrich Chemical Co. There are no restrictions for entry into the contest; membership in SPE is not required, and there is no age limitation. Contest papers may be on any subject of general interest to the plastics industry which has not been published prior to the national SPE meeting in January, 1949, Papers must not exceed 5,000 words in length, exclusive of diagrams and photographs.

Local section contests will close on or before November 15, and winning local papers must be in the hands of Mr. Moulton by November 30. The papers will be judged by a committee of acknowledged authorities in the plastics industry and the following prizes awarded: first, prize \$200; second, \$100; and third, \$50. Manuscripts submitted in the contest will not be returned, and the Society reserves publication rights of local prize winning papers antil June 1, 1949. National prize winners will be invited to present their papers at the January, 1949, annual meeting.

Tours Plastic Plant; Hears Schack

A total of 61 members and guests attended a meeting of the SPE Central Ohio Section on April 16, at the Seneca Hotel, Columbus, Columbus Plastic Products, Inc.,

was host to the Section, and the meeting was preceded by a guided tour of that company's new plant. After dinner Frank Schneider, Inland Mfg. Co., gave an informative talk on "Plastics in the Automotive Industry." Favors in the form of a dozen plastic combs were given by Columbus Plastic to each member attending the meeting.

The Central Ohio Section met again on May 12 at the Berwick Hotel, Cambridge. Approximately 26 members and guests attended the dinner-meeting and heard William Schack, fomer field Plastics magazine, speak on "Publicizing Plastics." Mr. Schack discussed basic approaches to publicity for both plastics processors and product manufacturers, including proprietary molders, and reviewed the following publicity media: newspaper and wire service, general magazines, trade journals, and radio. The speaker stated that of the media the abundant number of trade journals, approximately 2,500, represented perhaps the greatest potential turn for each advertising dollar spent. The speaker also deplored attempts by companies to obtain publicity without divulging anything worth publicizing. Victor Blasutta, chief engineer of Denison Engineering Co., also spoke briefly on special applications of Denison equipment in

the plastics industry.

The Section will hold a social meeting on June 16 at the Hotel Mayfair, Colum-

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Buffalo Section Sponsors Diversified Program

The April 2 Ladies' Night meeting of the Buffalo Section at the Park Lane Restaurant attracted 55 members, guests, and their wives. After dinner, Miss Marion Gough, feature editor of House Beautiful. gave her impressions of consumer attitudes toward plastics. Miss Gough stated that she had found the reaction of the average consumer toward plastics to be derogatory, that she was impressed by the predominance of bad design, and that she felt the plastics industry itself was not handling its materials properly. As solutions, she suggested that designers, not plastics engineers, design plastic products to avoid imitation of designs in other materials, and recommended the use of informative labeling and advertising and the establishment of some system to keep inferior prod-ucts off the market. The meeting also fea-tured a display of fabricated vinyl sheet products by Cox Plastics, Inc., and the presentation to the ladies of vinyl-packaged bathsalts by Reta Lloyd, Inc.

On April 30 approximately 32 members and guests of the Section heard Hugh Cameron, of W. T. LaRose & Associates, Inc., give a comprehensive review of the applications of electronic heating in the plastics industry, including the preheating of thermosetting preforms and the sealing of sheet and film materials. Mr. Cameron's talk, which he has recently presented be-fore a number of SPE sections, was illustrated by the use of small, demonstration reacted by the use of shall, definished and electronic heaters. The Carborundum Co. had on display samples of its abrasive products in which plastic materials are utilized as binders and presented pocket

utilized as binders and presented pocket stones to those present.

The June 25 meeting will be the group's annual golf outing and will also feature a talk on "Injection Molding and Mold Design" by Gordon B. Thayer, Dow Chemical Co.

An educational exhibit by the Buffalo Section highlighted displays by the plastics industry at the Buffalo Industrial Progress Exposition, held at the 65th Regiment Armory on May 14 to 23. Space for the SPE exhibit was donated by the Buffalo Chamber of Commerce, and the exhibit itself was made possible by contributions from Durez Plastics and Chemicals Inc., Durite Plastics Division of Bor-den Co., Norton Laboratories, Inc., Plas-kon Division of Libbey-Owens-Ford Glass Co., and Varcum Chemical Corp.

A director's meeting of the Buffalo Section had been held March 15 at the home of J. Clarke Cassidy, Section secretary, in Niagara Falls, N. Y. It was decided to make Ladies' Night an annual affair and to set up a speakers' bureau to aid in the dissemination of general information on plastics to the public.

Cleveland-Akron Section in the Heavens

The April 30 meeting of the SPE Cleveland-Akron Section was of a social nature to which wives of members and other guests were invited. An attendance of 38 met for a dinner at the Church of the Cross, Cleveland Heights, and then gathered at the Warner & Swasey Observatory, Case Institute of Technology, E. Cleveland, to hear Observatory Director J. J. Nassau speak on "The Universe of the Steet" J. J. Nass the Stars.

Dr. Nassau's talk was non-technical in nature and planned especially for the meet-The speaker discussed the structure of the universe, described the work of such men as Einstein, Newton, and Copernicus in the advancement of astronomy, and by means of illustrations compared the rela-



M. S. Moulton, Secretary of Cleveland-Akron Section, Presenting First Place Award in SPE 1947 Prize Paper Contest to Carl E. Snyder

tive sizes of various stars, planets, and solar systems. The climax of the meeting was a trip up to the observation dome where the workings and uses of the 24-inch telescope were explained. Because of cloudy weather conditions it was not possible to use the telescope for observations, and the group descended to the lobby of the Observatory where various informative exhibits were examined.

At the business session, the first prize of \$500 in the 1947 SPE Prize Paper Contest was presented to Carl E. Snyder, Case Institute of Technology, for his paper on "Coumarone Indene Resins." It was announced that the Section's next meeting would be held May 28 at Tomlinson Hall, the new Union Club Bldg, at Case Institute Tentative plans call for Charles tute. Tentative plans call for Charles Franz, plastics consultant, to speak on "Estimating Manufacturing Costs and Establishing Selling Price."

Preduction Control for a Plastics Plant

Reversing the procedure of the preceding meeting, the SPE New York Section played host to the Newark Section at played host to the Newark Section at the May 11 meeting in the Hotel Shera-ton, New York, N. Y. Approximately 80 members and guests attended the dinner, which was followed by the introduction of James T. Growley, Celanese Plastics Corp. and president of the Newark Sec-tion, by New York Section President Ar-thur Nufer, Bakelite Corp. After the dis-tribution of three door prizes. Stanley tribution of three door prizes, Stanley Bindeman, Noma Electric Corp. and vice president of the New York Section, introduced the speaker, Herbert Spurway. Boonton Molding Co.

Mr. Spurway had for his topic, "Production Control as It is Applied to a Plastics Plant." He defined a production control system as being one which plans, controls, and expedites the production and shipment of customers' orders from the time of receipt until the time of billing. The proper application of such a system requires a knowledge of mold and tool requirements, packaging methods and inventories, raw material requirements and inventories, and shipping requirements. When properly set up and used, a production control system will give delivery information on any order; will show what equipment and materials are needed for an order, and the time they will be needed; and will give management information on the current status of the business and data on which to plan the future of the busi-

The speaker listed five criteria for a satisfactory production control system:
(1) flexibility; (2) instantaneous controls; (3) immediate information; (4) minimum of errors; and (5) low cost. Using slides, Mr. Spurway illustrated the forms used by the production control system in effect at Boonton Molding and showed how the system functions in relation to the company's other departments.

The next meeting of the New York Sec-

tion will take place on June 8 at the Hotel Sheraton. W. A. Crowder, Indus-trial Hard Chromium Co., will speak on "Chrome Plating of Molds." The Newark Section will hold its next

The Newark Section will hold its next meeting on June 9, at the Newark Athletic Club, on the subject of preheating. S. K. Moxness, Minneapolis-Honeywell Regulator Co., will discuss "Steam Preheating," and H. Cameron, W. T. La Rose & Associates, will speak on "Radio-Freeumery Problecting" Frequency Preheating.

Chicago Section Entertains National Board

The May 4 meeting of the Chicago Section was "National Directors Night," and officers and directors of the SPE who were in Chicago for a meeting of the Society's board of directors were introduced and spoke briefly on their interest in plastics and their affiliation with the SPE. The meeting, held at the Merchants & Manufacturers Cub, was attended by & Manufacturers Club, was attended by approximately 75 members and guests.

SPE national president, J. H. Dubois, Shaw Insulator Co., briefly reported on the highlights of the directors' meeting. He described the purposes of the Profes-sional Grade Membership recently established and the advantages which such membership will bring to the plastics engineer, and he reviewed the efforts of the Society's national officers to cooperate with other societies in the plastics industry to promote the welfare of both the plastics industry and engineer. Mr. Dubois also announced that the next SPE Annual Technical Conference will be held at the

Bellyue-Stratford Hotel, Philadelphia, Pa., on January 19 to 21, 1949.

In addition to Mr. Dubois and Mrs. Bess Day, of the SPE News, the following officers and directors were introduced: Mario J. Petretti, Noma Electric Corp., Mario J. Petretti, Xoma Electric Corp., national vice president; Robert G. Dailey, Wolverine Plastics, Inc., national secretary; Wilfred Lynch, Modern Molded Plastics, 1td., representing the Quebec Section; Wayne Pribble, Barrier, Pribble & Co., representing the Northern Indiana Section; C. W. Cooper, Battelle Memorial Institute for the Control Obis. Institute, for the Central Ohio Section; M. Scott Moulton, B. F. Goodrich Chemi-M Scott Moulton, B. F. Goodrich Chemical Co., for the Cleveland-Akron Section; C. T. Clark, F. Burkart Mfg. Co., for the St. Louis Section; S. K. Moxness, Minneapolis-Honeywell Regulator Co., for the Minneapolis Section; P. R. Marvin, Milwaukee Gas Specialty Co., for the Milwaukee Section; William J. Dunnican, Durite Plastics, for the Rhode Island & Southeastern Massachusetts Section; and Thomas E. Orr, Plastics Engineering, Inc., past national president.

Injection Molding and Plastics for Engineers

The April 23 meeting of the Detroit Section at the Wardell-Sheraton Hotel featured a talk on the Hy-Jector by Earle W. Johnson, sales manager of Rockford Machine Tool Co. Mr. Johnson's talk was similar to that given before the SPE New York Section on March 9, described on page 77 of our April issue. After the talk an open panel discussion on the subject of an open paner discussion on the subject of injection molding was held, with the following members participating: Harry Haaxma, Standard Products Co.; Jack Totten, Ford Motor Co.; L. J. Morrison, Detroit Mold Engineering Co.; Charles H. Frantz, plastics consultant; John Dietrich, Great Lakes Plastic Co.; and I. S. Miller, Durez Plastics & Chemicals, Inc.

Rechester Section Concludes Season's

The Rochester Section held a regular meeting on May 18 at Lorenzo's Restaurant. Guest speaker was Miss Marion Gough, of *House Beautiful*, whose topic was "Consumer Reaction to Plastics." Was Consumer Reaction to Frasues.
Miss Gough's talk was identical with the one she presented before the April 2 meeting of the Buffalo Section, reported above. Approximately 50 members and their wives attended this meeting, which concluded the club's spring program. Although the Section's next meeting will be held on September 21, the membership committee will conduct a campaign throughout the summer to increase membership in the organization.

Baltimore-Washington Section Elects First Officers

The recently organized SPE Baltimore-Washington Section met May 4 at the National Bureau of Standards, Washington, D. C., with 65 members and guests attending. William C. Goggin, plastics technical service manager for Dow Chemical Co., addressed the gathering on "Application Research in the Thermoplastic

Industry" and reviewed recent developments in the formulation and application polystyrene, saran, and ethyl cellulose

The following officers of the Section were elected: president, Gordon M. Kline, Bureau of Standards; vice president, A. M. Stover, Glenn L. Martin Co.; secre-M. Stover, Glenn L. Martin Co.; secretary, A. Lightbody, Navy Bureau of Ordnance; treasurer, J. B. Aliers, Navy Bureau of Ships; and national director, W. R. Bailey, Bureau of Ordnance, Other directors of the Section in addition to these five officers include: W. deC. Crater, Glenn L. Martin Co.; Peter King, Naval Research Laboratory; F. W. Reinhart, Bureau of Standards; and W. R. Sykes, Owens-Corning Fiberglas Corp. The following committee chairmen were also ap-

Mr. Alfers: and educational, Mr. King.
The Section plans a dinner-meeting in Baltimore early in June. Further details, including speaker and topic, will be an-

SPI Annual Meeting Hears Industry Problems Discussed

THE Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y., held its annual meeting May 20 and 21 at the Ambassador Hotel, Atlantic More than 600 members, repthe plastics industries in the resenting United States and Canada, attended the two-day conference which featured luncheon and dinner sessions in addition to regular meetings of the Society's technical and non-technical divisions. Members arriving early participated in a golf tournaat the Atlantic City Country Club on May 19.

Thursday, May 20

A general meeting was held on Thursday morning, with Nelson E. Gage, American Insulator Corp., presiding. The first speaker was Tino Perutz, Omni Products Corp., who discussed "Overseas Markets" and reviewed the problems involved in setting up a plastics exporting department in thing up a plastics segments at alk on "Merchandising Molded Plastics," by Charles W. Worley, B. W. Photo Utilities Corp., a paper on "The Molder Believes in Merchandising" was given by W. R. Dixon, Chandising was given by W. R. Dixon, and the plastic of the pl Dow Chemical Co. The future of the plas-tics industry will depend upon its ability to create mass demand. Mr. Dixon said, and the proper design and satisfactory pricing of a new product must therefore be followed up with an intelligent sales promotion program. The final speaker at this session was Ephraim Freedman, director of Macy's Bureau of Standards, who discussed "Plastics Potentials." Mr. Freed-man predicted an unlimited future for the plastics industry if it will pace its informative labeling program to its production, and if it will safeguard the quality of its products.

The luncheon session, presided over by D. S. McKenzie, plastics division, General Electric Co., featured a paper on "A Mail-Order House Surveys the Plastics Indus-Order House Surveys the Plastics Indus-try," by M. L. Poust, Sears Roebuck Co., and a talk on "The Advantages to Indus-try of Informative Labeling" by Harold W. Brightman, Lit Bros.

The financial and traffic division met in the afternoon, with William H. Nussbaum presiding. In a talk on "Today's High presiding. In a talk on "Today's High Break-Even Point," E. J. Johnson, a cer-tified public accountant, told the group that it is the job of top management to find a solution other than that of raising prices to the problem of the present high break-even point in business. An analysis of the material, labor, and other costs involved in the purchase and use of new equipment was given by E. H. Gabel, General Electric, in his talk on "How Much Can We Afford to Spend for New Equipment?"

The pressing need of an exact knowledge of costs instead of guesswork was emphasized by Edward Waygren, Mac-Donald Bros., Inc., in a paper on "Protection through Proper Cost Estimating."
"The Importance of Conserving Working Capital Today" was discussed by Samuel Booth, Bryant Electric Co., who stated that the plastics industry is now facing a recession and urged the conservation of working capital to meet any adversity. The final paper at the session was given by B. A. Butryman, Colt's Mfg. Co., on "Recent Trends in Transportation Rates Affecting Plastics.

The labor division also met during the afternoon, with Sidney I. Howell, Mack Molding Co., presiding. Three papers were presented at this session, as follows "Compensating the Salesman," by Gerald by Gerald C. Denebrink, Bigelow-Sanford Carpet Co., Inc.; "Labor Trends," by Benjamin Werne, labor counsel; and "Developments in Labor Relations," by L. W. Babcock, Hercules Powder Co.

A social hour was held in the evening; it was followed by a dinner in the hotel's Renaissance Room, presided over by SPI president, George H. Clark, Formica Insulation Co. After-dinner speakers were Sandwell, editor-in-chief of Canadian magazine. Saturday Night, whose topic was "Canada Has Her Own Future," and Josh Lee, member of the Civil Aero-rautics Board, who spoke on "Aviation in the New World."

Friday, May 21

Concurrent sessions were held on Friday morning by the Society's divisions on compression molding, extruding, fabricating, machinery, and plastics film, sheeting, and coated fabrics. The compression molders' session, presided over by John J. Bachner, Chicago Molded Products Corp., heard three papers: "Compression Molders' vision Plan of Organization" by by Mr. Molded Products" by W. F. Reibold, Waterbury Cos., Inc.; and "Future Trends in Materials Supply" by Frank H. Carman, Plastics Materials Manufacturers man, Plastics Materials Manufacturers Association. Mr. Carman reported that plastics production levels at a rate of 12% over the 1947 total are now being maintained and are practically meeting all requirements. The speaker gave an improved supply picture of raw materials and said that there is no prospect of shortages based on present requirements.

The extruders' session, presided over by George Gress, featured a paper on "Liquid Transmission through Extruded Polyethylene Film (in Relation to Packaging Chemicals and Cosmetics)" by J. H. Parliman, Plax Corp., and a paper on "The Factors of Screw Design in Extruding Cellulosics" by Paul Moeller and R. Phillips, Celanese Corp. of America.

Three papers were given before fabricators session, with Arthur deAngelis, Croasdale & deAngelis, Inc., presiding. Henry F. Pearson, Pearson-Berlinghof, Inc., spoke on "Industrial Designer's Viewpoint of Fabricating Potentials"; Hiram McCann, Modern Plastics, dis-cussed "Marketing Potentials in the Fabcussed "Marketing Potentials in the rap-ricating Field"; and F. W. Tetzlaff, Rohm & Haas Co., had for his topic, "Light-ing Fixtures from Acrylic Sheet." Only one paper, "The Competition of Tomorrow" by Tell Berna, National Ma-chine Tool Builders' Association, was

given before the machinery session, presided over by F. W. McIntyre, Reed-

Prentice Corp.

The meeting of the plastics film, sheeting, and coated fabrics division, with Frank J. Groten, Firestone Tire & Rubber Co., presiding, was devoted to progress reports by the chairmen of the division's technical sub-committees. Reports were given by J. W. Sinner, Glenn L. Martin Co.; David S. Plumb, Monsanto Chemical Co.; H. F. Robertson, Bakelite Corp.; F. C. Dulmage, Jr., Dow Chemical Co.; Talbot A. Lancaster, Plastic Film Corp.; James R. Blegen, Firestone Plastics Co.; William Aiken, Goodyear Tire & Rubber Co.; M. Scott Moulton, B. F. Goodrich Chemical Co.; and R. S. Hallas, also of Bakelite. Another sub-committee chairman, M. R. Radcliffe, O'Sullivan Rubber Corp., was unable to attend because of illness, and his report was read by Mr. Groten.

The Society's annual business meeting and election of officers took place at the luncheon session, after a talk on "Economic Trends of Today" by Leo M. Cherne, Research Institute of America, Inc. Neil O. Broderson, Rochester Button Co. and SPI chairman of the board, presided over the meeting, which commenced with a financial report by William T. Cruse, SPI executive vice president. A report was then given by President Clark, who said that arrangements have been completed to set up an industry-wide committee in case of an emergency. Mr. Clark also announced the establishment of an associate membership to permit further expansion of the Society's technical divisions. Negotiations with the SPE have been suspended, Mr. Clark reported, and are now undergoing a cooling-off period. Work on a new edi-tion of the SPI Handbook is beginning, and the new edition is expected to appear

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Elections of officers and directors were then held. Reelected were: Mr. Broder-son as chairman of the board; Mr. Clark son as chairman of the board; Mr. Clark as president; Gordon Brown, Bakelite Corp. as vice president; and Norman Anderson, General Molded Products Corp., as secretary. J. J. B. Fulenwider, Hercules Powder, was elected treasurer. Directors Powder, was elected treasurer. Directors elected to serve for the next year in addition to the officers were: I. D. Wintrob, M. Wintrob & Sons, Ltd.; Ralph David, Pacific Plastics magazine; Horace Gooch, Worcester Molded Plastics Co.; C. N. Sprankle, Sandee Mfg. Co.; M. L. Dinell, Clover Box & Mig. Co.; Mr. McIntyre; Mr. Groten; N. J. Rakas, National Automotive Fibres, Inc.; Mr. Gage; J. L. Howie, Jr., Grigoleit Co.; J. E. Gould, Detroit Macoid Co.; and Mr. McKenzie. The injection molders division met in

The injection molders division met in the afternoon, with Edward Singer, Victory Mfg. Co., presiding. Harold Spaulding, Electric Auto-Lite Co., dealt with "Developments of Lower Cost Injection Molds," and described the use of beryllium copper pressure castings by his company. A paper on "The Recent Advances in the Art of Injection Molding Large Pieces" was presented by George W. Whitehead, Improved Paper Machinery Corp., who reviewed machinery developments and showed slides of unique molding jobs. The third paper on the program was "The Often Slighted Factor of Close Die Temperature Control in Quality Injection Molding," by D. D. Davenport, Meridian Plastics, Inc. Concluding the program was a paper by C. J. Poiesz, National Bureau of Standards, on "The Development of a Specification for Polystyrene Wall Tile."

A meeting of the third National Plastics Exposition publicity committee was closely beld in the officeres.

also held in the afternoon, E. J. Pechin, Plastics Department, E. I. du Pont de Nemours & Co., Inc., presided over the meeting held to enable exhibitors to coordinate their own advertising and publicity programs for the Exposition with that of the SPI. Mr. Gage, chairman of the exposition committee, announced that there are already 105 exhibitors signed up, and that a buyer attendance of more than 30,000 is expected for the exposition, to be held in Grand Central Palace, New York, N. Y., on September 27 to October 2.

Williams Director of SPI Publicity

Langdon P. Williams has been appointed director of public relations for the Society director of public relations for the Society of the Plastics Industry, Inc., it was announced by William T. Cruse, SPI executive vice president. Mr. Williams previously conducted his own business in public relations, advertising, and publicity in New York, and before that had been advertising manager of City Title Insurance Co. and had spent 15 years in the sales promotion and advertising the sales promotion and advertised. years in the sales promotion and advertising departments of Revere Copper & Brass, Inc. Wesley S. Thurston, the former SPI director of public relations, is

new with the public relations department of Glenn L. Martin Co., Baltimore 3, Md. William H. MacHale, sales promotion and advertising manager of the plastics department, plastics and resin division, American Cyanamid Co., has been appointed department, of the averaging a public property of the averaging and the same appointed department of the averaging a public property of the averaging a public p pointed chairman of the exposition public-ity committee for the Third National Plas-tics Exposition, Mr. Cruse also amoumced. Other members of the publicity committee are E. J. Pechin and Don Masson, manager of publicity, Bakelite Corp.

CALENDAR

Apr. 15- America's Security Loan Cam-June 30. paign. (Buy U. S. Savings Bonds Now!)

Chicago Section, SPE. Merchants June 1. & Manufacturers Club, Chicago, III.

June 1. Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif. New Orleans Section, SPE. June 3.

Ontario Rubber Section, C.I.C. First Annual Field Day, Rouge June 5. Hills Golf & Country Club, Toronto, Ont., Canada.

June 6-11. SAE. Summer Meeting. French Lick Springs Hotel, French Lick, Ind.

June 7-10. Chemical Institute of Canada. Annual Conference. Mount Royal Hotel, Montreal, P. Q., Canada.

Thermoplastic Section, SPI. Canada. Royal York Hotel, Toronto,

Ont.
New York Section, SPE. Hotel
Sheraton, New York, N. Y.
Newark Section, SPE. Newark
Athletic Club, Newark, N. J.
Rubber Division, C.I.C. Windsor June 8.

June 9.

June 9. Hotel, Montreal.

June 7-12. International Textile Industries Exposition, Grand Central Palace, New York, N. Y.

June 11. Philadelphia Rubber Group. Kugler's Restaurant, Philadelphia,

SPI Canada. Mount Royal Hotel, June 15.

Montreal, P. Q. South Texas Section, SPE. Ben Milam Hotel, Houston, Tex. June 16.

June 16. Central Ohio Section, SPE. Social. Hotel Mayiair, Columbus, O.

June 18. Akron Rubber Group, Summer Outing. Lake Forest Country

Club, Hudson, O. Boston Rubber Group. Annual June 18. Outing. Woodland Golf Club, Newton, Mass.

June 18-20, American Council of Commercial Laboratories. Annual Meeting. Colorado Springs, Colo.

June 21-26. National Swim Week.

June 21-26, A.S.T.M. Annual Meeting and Eighth Exhibit of Testing Apparatus & Related Equipment. Detroit. Mich.

June 24. Northern California Rubber Group.

Rhode Island Rubber Club. Summer Outing. Pawtucket Golf Club, June 24.

Pawtucket, R. I. Detroit Rubber & Plastics Group, June 25. Inc. Summer Outing. Forest Lake

Country Club.

Quebec Rubber & Plastics Group. June 25. Annual Golf Tournament. Granby Gol: Club, Granby, P. Q., Canada.

Buffalo Section, SPE. Annual Golf June 25. Get-Together.

June 26. New York Rubber Group. Annual Outing, Doerr's Grove, Short Hills, N. J.

SPI Low-Pressure Industries Division. Seminar. Statler Hotel, Washington, D. C. June 29-30.

Chicago Rubber Group. Annual Golf Outing. Acacia Country July 17. Club.

July 22-23. Division of Rubber Chemistry, A.C.S. Summer Meeting. Mayfair Hotel, Los Angeles, Calif.

July 24-25. Los Angeles Rubber Group, Inc. Annual Summer Outing. Cataling Island.

Cochrane Receives Hyatt Award

PRESIDENT HARRY S. TRUMAN presented the John Wesley Hyatt Award, consisting of a gold medal and \$1,000, to John D. Cochrane, Jr., director of research and development, Formica Insulation Co., in a ceremony at the White House on May 25. The award is made annually to an individual making an outstanding achievement in the plastics instanding achievement in the plastics in-dustry and, since its establishment in 1941, has become the highest honor given in the plastics industry. Mr. Cochrane received the award for outstanding work in the development of decorative laminates from development of decorative laminates from synthetic and natural resins. Following the presentation, Mr. Cochrane was guest of honor at the annual award banquet, given at the Anderson House, and attended by representatives of the government, the Army and Navy, and the plastics and chemicals industries.

A graduate of Massachusetts Institute of Technology, Mr. Cochrane joined Formica in 1925 as a project engineer. Since 1927 he has been instrumental in the development of laminated plastics sections, inlaid designs, and panels which are proof against cigarette burns, stains, and other scars. These laminated panels find wide use in table tops, walls, desks, bar and soda fountain tops, door panels, and many other domestic and public building applications. Mr. Cochrane is the seventh recipient of the award named in honor of John Wesley Hyatt, the inventor of celluloid, and spon-sored by Hercules Powder Co.

New Decorative Material

NEW type of decorative material suitable for both horizontal and vertical surfaces is being produced in quantity by United States Rubber Co., Rockefeller Center, New York, N. Y. Known as Satusply, the material consists of paper or cloth completely impregnated and surfaced with a polyester thermosetting resin, then processed under heat and tension. Color and design possibilities are almost unlimited since a variety of papers or cloths in plain colors or in designs can be used for

the base. The degree of stiffness can also be controlled during manufacture. Satusply is now being produced in 34 different colors and patterns, with glossy or satin finish, and a cigarette-proof type is also available in all colors, designs, and finishes. The material is made in continuous rolls and in several widths and thicknesses. The cigarette-proof type comes in a standard roll 60 linear feet long; while the regular type comes in a roll 90 feet long. The protective coating formed by the resin makes the material washable and highly resistant to stains, acids, alkalies, and wear, it is further claimed. Among the important uses foreseen for the product are wall coverings in rooms and corridors, furniture surfacing, and tops for tables, counters, and desks.

counters, and desks.

The plastic material can be manually applied on the job without mechanical pressure, for either new installations or for refurbishing. The company is also producing a special cement. Satusply-Sement, for bonding the material to the base surface. The counter is furtible in continuer. face. The cement is furnished in containers for application on the job, and for certain uses is preapplied to the back of the sheets at the factory for installation in the field. Both the plastic material and cement will be sold through leading distributors who will furnish assistance and instruction to

June, 1948

Scientific and Technical Activities

Thomas Institute Medalist

THE Gold Medal of the American Institute of Chemists for the year 1948 was awarded to Charles Allen Thomas, executive vice president and technical director of the Monsanto Chemical Co., at the Silver Anniversary Dinner of the Institute, held jointly with the New York Section of the American Chemical Society at the Waldorf-Astoria in New York on May 7. Dr. Thomas is A.C.S. president and was also recently honored by being elected to the membership of the American

Academy of Sciences.

The Gold Medal Award was made in recognition of Dr. Thomas's work in the development of atomic energy and his leadership in research, particularly in synthetic resins, and also for his administrative ability and his encouragement of basic Foster D. Snell, retiring president of the Institute, presented the medal to Dr. Thomas. Francis J. Curtis, Mon-santo vice president, spoke on the career

of the medalist.

In his acceptance address Dr. Thomas emphasized the new role that scientists are taking in the industrial leadership of America. The merchandise, the service, and the administration of modern business are so scientific and complex that technical training is needed in almost all depart-

ments, he said.

The biggest problem confronting the scientist caught up in the definite trend toward industrial leadership is the perplexing difference that arises out of dealing with people instead of things. In the laboratory the scientist is accustomed to relying upon unchanging scientific laws. In an executive capacity the scientist finds he is dealing primarily with people who are constantly changing their points of view, who are always striving, and who cannot always be depended upon to act or react twice in exactly the same way. He has been accustomed to handling things that can be measured. Now he must deal with things that are unmeasurable.

A course in self-education is necessary. Dr. Thomas added. The scientist must be as familiar as possible with the way people think, the way they act, and with the motives that influence their lives. He must have some knowledge of finance. He must be conscious of labor problems and keep informed on the changes in employer-

employe relations.

It is apparent that the executive must move in a far larger periphery than the scientist who is left undisturbed in his ivory tower. The job of administration is a challenge. In essence it is a transition, generally gradual, from actual work to the work of making decisions so that others may work more profitably, Dr. Thomas stated.

Polysar Brand Name Adopted

POLYMER CORP., Sarnia, Ont., Canada, has adopted a brand name, Polysar, to distinguish its various types of rubber, it was announced by J. R. Nicholson, executive vice president. In a new code book issued to the rubber processors of Europe, Africa, and North and South America, the company lists 23 types of rubber each having the name Polysar used to prefix a code designating a particular

Butyl rubber is designated Polysar Butyl; GR-S copolymers are called Polysar S; high-styrene copolymers of butadiene and styrene are designated Polysar SS; Polysar N is used for nitrile copolymers; Polysar NP designates special-purpose butadiene-acrylonitrile copolymer intended for use as a plasticizer for polyvinyl chlor-

The company's new coding system is flexible enough to permit the addition of new types developed by its research department. The Polymer Corp. code designations and their Rubber Reserve equiva-

lents are listed below:

RUBBER RESERVE POLYMER CODE Polymer Cobe
Polysar S-10
Polysar S-17
Polysar S-20
Polysar S-50
Polysar S-50
Polysar S-65
Polysar S-65
Polysar S-345
Polysar S-345
Polysar S-42
Polysar S-42 Standard GR-S GR-S-20 GR-S-50 GR-S-65 GR-S-AC GR-S-X-345 GR-S-X-371 GR-S-Latex Type II GR-S-Latex Type IV GR-S-Latex Type IV Polysar SS 300 (no equivalent) Polysar N 300 Polysar NP 450 GR-A (no equivalent) Polysar Butyl 100 Polysar Butyl 200 Polysar Butyl 201 Polysar Butyl 202 Polysar Butyl 300 Polysar Butyl 301 Polysar Butyl 400 GR-I R-2 GR-I-50 GR-I R-13 GR-I R-15 GR-I Y-15

Field on Geon Polyblends

THE May 7 meeting of the Chicago Rubber Group featured a talk on "Processing and Physical Characteristics of Geon Polyblends" by George E. Field, technical service engineer for B. F. Goodrich Chemical Co. The meeting, attended some 100 members and guests, was held at the Morrison Hotel, Chicago, Ill

Mr. Field explained that the colloidal blending of Hycar rubber and Geon polyvinyl chloride resin results in Geon Polyblend, a material having properties different from those of the parent materials. The Hycar acts as the plasticizer for the vinyl resin, and in many cases it is not necessary to use an ester-type plasticizer when processing the Polyblend. An advantage of Geon Polyblend over millblended mixtures of Hycar and Geon is that it can be fluxed for a longer period of time and at higher temperatures than can the latter blends. The speaker also discussed the further advantages of Polyblend in improving the properties of vinyl resins. He stated that the non-migration, non-extraction, and non-volatile features of Polyblend were important in a number of present applications and would play an important part in future uses. Mr. Field considered the use of additional ester-type plasticizer in Polyblend processing and summarized the properties obtained by such addition.

The Group held elections of officers for the 1948-1949 season, with the following

results: chairman, Robert C. Dale, Inland Rubber Corp.; vice chairman, W. H. Peterson, Enjay Co., Inc.; and secretary-treasurer, Ray G. Penner, W. H. Salisbury Co. The following members comprise the Group's executive committee: Samuel G. Group's executive committee: Samuel G. Armato, Witco Chemical Co.; Robert E. Elliott, Standard Oil Co. (Indiana); Douglas P. Johnstone, D. P. Johnstone Co.; Albert L. Meyer, Herron & Meyer (Chicago); Maurice J. O'Connor, C. P. Hall Co.; A. G. Susie, Marbon Corp. (representing the rubber chemicals suppliers); Herman Boxser, Acadia Synthetic Products Division of Western Felt Works; B. F. Benson, Inland Rubber Corp.; Robert H. Barbour, Sirvene Division of Chicago Rawhide Mfg. Co.; Vincent J. Labrecque, Victor Mfg. & Gasket Co.; Dwight Smith, Inland Rubber Corp.; and Charles E. Wonder, Van Cleef Bros. (representing the rubber manufacturers). The nominating committee consisted of the following members: James P. Sheridan, New Jersey members: James P. Sheridan, New Jersey Zinc Sales Co., chairman; Mr. Armato; Bruce W. Hubbard, Ideal Roller & Mig. Co.; T. McIlhenney, Shell Petroleum Co.; Mr. Susic; S. L. Weller, E. I. du Pont de Nemours & Co., Inc.; and H. A. Win-kelmann, Dryden Rubber Division of Sheller Mfg. Co. Preceding the meeting a drive for funds, arranged for by Al Stein. H. Muehlstein & Co., was put on by representatives of the American Cancer So-

Los Angeles Group Meeting

THE May 4 meeting of the Los Angeles THE May 4 meeting of the Los Angeles
Rubber Group, Inc., at the Hotel Mayfair was attended by approximately 18;
members and guests. At the afternoon technical session, Lou F. Gongwer, chief
chemist and manager of the development
department of J. M. Huber Corp.'s Borger, Tex., plant, spoke on "Clays for Rubber." Mr. Gongwer's talk was identical to the one he presented before the April 29 meeting of the Northern California Rubber Group and reported on page 246 of our May issue. At the dinner session James F. Bone, manager of the industrial department, Los Angeles Chamber of Commerce, spoke on "The Industrial Economy of Los Angeles."

The meeting was "United States Rubber Night" and was sponsored by the United States Rubber Co. of Los Angeles, which supplied prizes won by Carl Hoglund, Dickson Sheppard, and Phil Drew. all of Goodyear; A. Legman, of A. Leg-man Trucking Co.; Roy Phelan, of Atlas Sponge Rubber Co; R. L. Roby, Accurate Products Co.; Robert Bowen, Xylos Rub-ber Co.; Bud Burson, H. M. Royal, Inc.; Earl Farlow, a guest; and George Miller, W. J. Voit Rubber Corp.

At the April 12 meeting of the Group's board of directors, the following new members were elected: Wallace S. Anderson and John W. Wardman, both of Firestone Tire & Rubber Co.; Francis L. Beiter, Golden West Rubber Mills; Dane E. Budnick and C. L. Harmon, both of Kirk-hill Rubber Co.; Carl J. Minnig, Witco Chemical Co.; George M. Onury, Overseas Weighing Corp.; Carl R. Shaffer, Xylos Rubber; and Merlyn F. Teskey, Teskey Transportation Co.

Additional Experimental GR-S Polymers and Latices

A DDITIONS to the list of experimental GR-S dry polymers and GR-S latices, available for distribution to rubber goods manufacturers under the conditions outlined in our November, 1945, issue, page 237, have been received and are listed in the table below.

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Normally, experimental polymers will be produced only at the request of the consumers, and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside, if possible, for distribution to other interested companies for their evaluation. The 20 bales, when available, will be distributed in quantities of one bale or two bales upon request to the Sales Division of Rubber Reserve, or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received to warrant them.

As announced in our last listing of experimental polymers, it is believed that the GR-S polymers made each month should be listed without description to indicate which polymers are currently commercially available. The numbered and experimental GR-S polymers and latices produced during April follow: Experimental GR-S polymers—X-181-SP, X-274, X-278-SP, X-360, X-392-SP, X-385, X-410, X-415, X-416, X-419, X-422, X-427, X-430, X-435, X-439, X-433, X-448, X-457, and X-548; Numbered GR-S polymers— GR-S, GR-S-AC, GR-S-SP, GR-S-10, GR-S-10-AC, GR-S-12-AC, GR-S-20, GR-S-20, GR-S-21, GR-S-50, GR-S-60, GR-S-6

X-Number Designation	Manufacturi Plant	NG DATE OF AUTHORIZATION	POLYMER DESCRIPTION	Special Characteristics
X-452-GR-S	Goodrich, Port Neches	5-11-48	GR-S stabilized with Stalite to be used as the standard reference test sample start- ing July 1, 1948.	Standard reference bale.
X-453-GR-S	Copolymer, Baton Rouge	5-11-48	Polybutadiene polymerized 41° F. and stabilized with BLE at 40 to 45 Mooney. Rosin soap emulsification used.	For low-temperature service evaluation.
X-454-GR-S	Copolymer, Baton Rouge	5-11-48	A 90 butadiene-10 styrene monomer charge ratio GR-S with rosin soap emulsifica- tion polymerized at 41° F, and stabilized with BLE at 40 to 45 Mooney.	For low-temperature service evaluation.
X-455-GR-S	U. S. Rubber, Borger		A GR-S black masterbatch containing 66 parts of SRF black per 100 parts continuous GR-S-10 stabilized with 1.5 parts BLE at 54 ±4 Mooney viscosity.	A GR-S black masterbatch for those consumers preferring rosin soap emulsified GR-S (GR-S-10).
X-456-GR-S	U. S. Rubber, Borger		A GR-S black masterbatch containing 50 parts of EPC black per 100 parts continuous GR-S-10 stabilized with 1.5 parts BLE at 54 ± 4 Mooney viscosity.	A GR-S black masterbatch for those consumers pre- ferring rosin soap emulsified GR-S (GR-S-10). Other- wise similar to GR-S-Black I except for higher Mooney viscosity of contained poly- mer.
X-457-GR-S	U. S. Rubber Borger		A GR-S black masterbatch containing 55 parts Phil- black A per 100 parts GR-S type of polymer stabilized with 1.5 parts BLE at 37 ±4 Mooney viscosity.	
X-458-GR-S.	U. S. Rubber, Borger	1	A GR-S black masterbatch containing 60 parts of Phil- black 0 per 100 parts GR-S type of polymer stabilized with 1.5 parts BLE at 37 ±4 Mooney viscosity.	
₹-459-GR-S	U. S. Rubber, Borger		A GR-S black masterbatch containing 50 parts EPC black per 100 parts EPC black per 100 parts GR-S type of polymer polymerzed at 41° F. Rosin soap mulsification used in contained polymer which is stabilized with 1.5 parts BLE at 60±5 Mooney.	
K-460-GR-S	Canadian Syn- thetic, Sarnia, Ont., Canada	I S	Alum coagulated GR-S nade in regular standard plant equipment with a hortstopped Mooney of 50 ±4.	

Synthetic Rubber Symposium

HEMICAL engineering developments in the synthetic rubber program was the subject of a symposium at the regional meeting of the American Institute of Chemical Engineers, on May 9 to 12, at the Hotel Hollenden, Cleveland, O. Nearly 200 engineers attended the synthetic rubber symposium, presided over by W. I. Burt, vice president of B. F. Goodrich Chemical Co. and a director of the Institute. The symposium consisted of five papers whose subject matter for the most part was not new to rubber chemists, but which was intended to acquaint chemical engineers in other fields with the process and equipment problems which arose during the wartime synthetic rubber program.

The first paper was "Development of Large-Scale Emulsion Polymerization in the GR-S Program," by John T. Cox, Jr., and Paul S. Forsyth, both of ORR. This paper gave a resumé of the laboratory work which led to the development of the large-scale reactors used at present in the GR-S plants and outlined the improvements which have been incorporated during the years of operation.

ing the years of operation.
"The Porous Sheet Process of Drying GR-S American Rubber," by Williard F. Bixby, Goodrich Chemical, was the sec-

ond paper on the program. The application of a Fourdrinier-type drier, commonly used in the paper industry, to the drying of GR-S was discussed, and it was pointed out that the drying of GR-S after coagulation requires simultaneous diffusion of heat into the rubber and removal of water at a temperature that will not adversely affect the physical properties of the product. This can be accomplished by coagulating the rubber in small, uniform crumbs which can be formed into a thin, porous sheet. This sheet is exposed to a relatively high temperature, but for too short a time to affect physical properties.

The third paper, by D. H. Francis and H. R. Sontag, Goodyear Synthetic Rubber Corp., dealt with "Some Factors Affecting Continuous Polymerization of Synthetic Rubber." This paper gave a brief history of the development of the continuous flow process of polymerization and described the charging equipment, reaction vessels, and method of shortstop addition to control the polymerization. The variations in new materials that influence polymerization were also discussed.

"Development of Monomer Recovery in GR-S American Rubber," by C. R. Johnson and Walter Otto, Firestone Tire & Rubber Co., was the fourth paper. The development of both batch and continuous

processes for recovering unreacted butadiene and styrene was described, and the problems involved in the design of these plants were also considered.

plants were also considered.

The final paper of the symposium was "Latex Incorporated Carbon Black for Synthetic Rubber," by John C. Madigan and James W. Adams, of United States Rubber Co. This paper noted that GR-S black masterbatches now comprise 12% of all GR-S produced. An explanation was given of the engineering problems involved in handling the black, mixing the slurry with the latex, and subsequent coagulation and drying operations.

Mark to Give Howe Lecture

HERMAN F. MARK, professor at Polytechnic Institute of Brooklyn and a world authority on the chemistry of rubber, plastics, and wood, has been chosen to present the fourth Harrison Howe Lecture sponsored by the Rochester Section of the American Chemical Society. The announcement was made by Ethel L. French, of the University of Rochester and chairman of the Section, who said that the lecture will be given in November.

Southern Ohio Group Outing

THE Southern Ohio Rubber Group held its annual outing on May 15, with 83 members and guests attending. The day began with a morning golf session at the Troy Country Club, Troy, despite intermittent rain and a soggy course. Golf prizes were won by the following: liquor, Ralph F. Wolf, Columbia Chemicals Divi-Ralph F. Wolf, Columbia Chemicals Divi-sion of Pittsburgh Plate Glass Co., Wil-liam Whitaker, Herron Bros. & Meyer, and R. S. Radow, Inland Mfg. Division of General Motors Corp.; golf balls, R. H. Marston, Binney & Smith Co., R. B. Sucher, R. E. Antheil, and Jack Jones, all of Inland, F. C. Rohel, Amsco Products, Inc., Riand, P. C., Rohel, Amsco Products, Inc., R. A. Emmett, Binney & Smith, R. L. Longanecker, Dayton Rubber Co., Donald Simonds, Godfrey L. Cabot, Inc., and Frank Woznak; and ice tongs, J. E. Feldman and H. L. Weese, both of Inland, John Lucid, P. A. MacPhee, National Cash Register Co., R. K. Ritzert, Dayton Rubber, and Robert Feldhaus, A picnic session, including lunch and

A picuic session, including lunch and liquid refreshments, took place during the afternoon at Edelweiss Park, near Dayton. The program lasted until dusk and consisted of many sporting contests, including softball and volley ball. The outing ended with the distribution of door prizes, won by the following: liquor, Roy Smith: tackle box, Mr. Woznak; badminton set, Mr. Weese; fishing reel, L. D. Neu, Inland; brief case, E. C. Dill, Inland; golf balls, Mr. Antheil and E. H. Kremer, Dayton Rubber; and tenderized 12-pound hams, John Poffenberger, Mark Deal, R. R. Hickernell, and D. R. Buchanan, all of Inland, and Messers. Feldman, MacPhee, and Radow.

The outling was held to be a complete consisted of many sporting contests, in-

The outing was held to be a complete The outling was held to be a complete success, and appreciation was expressed to general outing chairman, Mr. Ritzert, golf chairman L. J. Keyes, Dayton Rubber, and picnic committeemen P. J. Berner, Inland, D. J. Doherty, Herron Bros. & Meyer, S. H. Brandenburg, Plastic & Rubber Products Laboratorics, and D. A. Meyer, Dayton Publisher. ton Rubber.

New OTS Reports

THE Office of Technical Services, United States Department of Commerce, Washington, D. C., has announced the availability of two new reports on phases of the German rubber inclustry. The first report, prepared by T. G. Schonfeld and K. H. Weber, gives information on the compositions and properties of different rubber compounds developed by the Germans for use in gaskets and rings in contact with concentrated hydrogen peroxide. Mimeographed copies of this six-page re-port, PB-85151, "Rubber Compositions Re-sistant to Highly Concentrated Hydrogen Peroxide," sell for 25¢ each.

The second report gives a comprehensive description of processes for the manufacture and purification of arc acetylene used at the I. G. Farben plant at Huels. brepared by D. L. Fueller, H. M. Weir, A. O. Zoss, P. J. Leaper, O. G. Direnga, and R. J. Fontera, the report discusses in detail the arc and carbon separation operations, the purification steps, and the methods used to separate product gases. Mimeographed copies of this 134-page report. PB-81826, "Manufacture and Purification Arc Acetylene," sell for \$3.50 each, Orders for these reports should be ac-

companied by check or money order payable to the Treasurer of the United States.

New Standard Hydrocarbon Samples

*HIRTEEN new NBS standard hydrocarbon samples have been announced by the National Bureau of Standards, bringing to 139 the number of such compounds now available for calibrating analytical instruments and apparatus in the research, development, and analytical laboratories of the petroleum, rubber, chemical, and allied industries. These samples have been prepared as part of a cooperative program of the Bureau and the Petroleum Institute begun in 1943. The 13 new compounds are given below:

NBS Sample No. *	Compound	Amount of Impurity† Mole &	Vol per Unit Ml.
270-58	cis-1, 3-Dimethyl-		
	cyclopentane	0.65 ± 0.23	5
513-5S	1, 3-Butadiene	0.08 ± 0.04 §	5
530-58	2-Methyl-1-pentene	0.19 ± 0.09	5 5
532-58	4- Methyl-l-pentene	0.18 ± 0.12	5
541-58	2, 2, 3-Trimethylhexane	0.30 ± 0.20	5
544-58	3, 3, 4-Trimethylhexane	0.23 ± 0.10	5
547-58	4. 4-Dimethyl-l-pentene	0.15 ± 0.08	5
548-58	trans-4-Octene	0.16 ± 0.11	5
549-5S	2-Methyl-l, 3-butadiene		
	(Isoprene)	0.04 ± 0.03 §	5
550-5S	2. 3, 3-Trimethyl-l-butene		5 5 5
551-58	1-Nonene	0.24 ± 0.18	5
	1-Decene	0.11 ± 0.07	5
	1. 5-Hexadiene	0.11 ± 0.08	5

* The designation "55" indicates a sample of five-mil. sealed "in vacuum" in a special pyrex glass ampoule with internal "break-off" tip. † Purity evaluated from freeaing point measurements, as described in J. Research NBS, 35, 355 (1945). RP1676, unless otherwise indicated. † Tolerance approximately ±10%. † When sealed, Polymer formed may be removed as residue by simple vaporization of the sample "in vacuum" at an appropriate temperature. † Estimated by analogy with isomers subjected to similar purification.

Instructions for transferring standard samples of hydrobarbons "in vacuum" are available upon request. A complete list of NBS standard samples of hydrocarbons, together with instructions for ordering, may also be obtained from the National Bureau of Standards, Washington 25, D.C.

Color Matching in Rubber

A MEETING of the Connecticut Rubber Group was held in the auditorium of the United Humination Co., New Haven, Conn., May 14. There were 90 members and guests in attendance to hear A. J. Northam, of E. I. du Pont de Nemours & Co., Inc., talk on "Color Matching—Rubber,"

Some of the factors which affect the development of a desired color in rubber are the grades of rubber used, the other compounding ingredients, the amount of combined sulfur, and the type of acceleraters and antioxidants used. Color in rubber compounds may also vary, depending on the method of curing, i.e., press, open steam, dry heat, sulfur monochloride, etc. It was pointed out that color in rubber may be accurately measured with a recording spectrophotometer.

At a business session conducted by Chairman Raymond H. Dudley, Whitney Blake Co., a financial report by Carl Lar-son, also of Whitney Blake, and a nominating committee report by Al Jennings, du Pont, were heard. W. J. O'Brien, Jr., Seamless Rubber Co., spoke on the advantages of membership in the Division of Rubber Chemistry, A. C. S., and Pat Rooney explained plans for the outing of the Group which is scheduled for August 14.

Dinsmore Thiokol Club Speaker

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A N AUDIENCE of more than 80 persons heard R. P. Dinsmore, vice president in charge of research and development, Goodyear Tire & Rubber Co., talk on "Snapshots of the Rubber Indusat a meeting of the Thiokol Technical Club, held at the Thiokol Corp., Trenton, N. J., on May 20. The meeting was preceded by a social hour and a buffet dinner.

J. W. Crosby, Thiokol president, presided and introduced Dr. Dinsmore. Mr. Crosby mentioned the latest honor that has been conferred on Dr. Dinsmore by the Institution of the Rubber Industry, London, England, in awarding him the Colwyn Gold Medal for 1947. Dr. Dinsmore will receive the medal at the Rubber Technology Conference in London.

The speaker first paid tribute to "Thiofor a stee first synthetic rubber manufactured in the United States and then said that the purpose of his talk was to discuss the general rubber situation as it exists at present, with special reference to the American synthetic rubber industry. It was emphasized that although the price of No. 1 smoked sheet rubber was about 23c a pound at the present time, the average price of the natural rubber being used, because of the greater avail-ability and lower price of lower grades, was actually about 1712¢ a pound. With GR-S selling at 18 c a pound, the voluntary use remained less than it might be if the synthetic rubber had a greater price advantage. With a real 2¢ to 4¢ a pound price differential between natural and synthetic rubber, it was estimated that a much greater voluntary use of the synthetic would

Dr. Dinsmore stated that the present GR-S quality is satisfactory for about 50% of the market and that the main disadvantages to its greater use are poor high temperature and resilience properties. Data were presented to show how by varying the viscosity of the crude GR-S as produced and by the use of new high modulus furnace blacks, improvements in factory processing could be obtained. It was also pointed out that better processing for a given stiffness of GR-S could be obtained by not carrying the polymerization reaction so far as usual and by polymerizing at lower temperatures.

In conclusion Dr. Dinsmore said that the so-called "low temperature rubber" was a considerable improvement over regular GR-S, but that synthetic rubber would not be able to equal the value of natural rubber until its resilience was more nearly the same.

Hold Film Night

THE May 7 meeting of the Ontario Rubber Section, C.I.C., was held in conjunction with the Buffalo Rubber Group at the General Brock Hotel, Niagara Falls, Ont. Approximately 85 members and guests of the groups attended the meeting, which featured the showing of two films. The first film, presented through the courtesy of Dunlop Tire & Rubber Co., Ltd., covered the work of the company during World War II. The second film, a Walt Disney production in color, was the Firestone Tire & Rubber Co. picture. "The Building of a Tire.

The Ontario Section will hold its first annual Field Day on June 5 at the Rouge Hills Golf & Country Club, Toronto, Ont. aker

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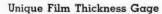
ORLD

Rubber Division Summer Meeting

FURTHER details of the summer meeting of the Division of Rubber Chemistry, A. C. S., to be held in Los Angeles, Calii., July 22 and 23, at the Mayfair Hotel, have been announced. D. C. Maddy, Harwick Standard Chemical Co., 1248 Wholesale St., Los Angeles, 21, is chairman of the local committee on arrangement of the local committee on arrangement of the local committee on arrangement. man of the local committee on arrangements and will arrange hotel accommodations for members and guests desiring to attend. A hotel reservation form has been sent to Division members.

Registration will begin at 9:00 a.m., July 22, at the Mayfair Hotel, and techni-July 22, at the Maytair Hotel, and technical sessions will be held beginning 10:00 a.m. and 2 p.m., July 22; 9:00 a.m. and 2:00 p.m., on July 23. The Division banquet is scheduled for the Biltmore Hotel, at 7:00 p.m., July 22 and will be featured by presentation of the Charles Goodyear Medal to David Spence, the first person designated to region this bonce, but the designated to receive this honor by the Division in 1942. Arrangements for the hanquet are in charge of C. H. Churchill, Sterling Rubber Products Co.

The regular annual summer outing of the Los Angeles Rubber Group is sched-uled for Saturday and Sunday, July 24 and 25, following the Rubber Division meeting, so that those attending the meeting may also attend the outing if they desire. The program consists of a boat trip to Catalina Island and golf, fishing, and other sports; return is by boat Sunday afternoon. A reservation form for the outing has been mailed all Division members. As it is a distinct innovation for the Divison of Rubber Chemstry to hol' three meetings in a calendar year, the officers and directors of the Division urge mem-bers to make a special effort to support the Los Angeles meeting.



CARBON 14, a radioactive isotope derived as a by-product of the atomic energy plant at Oak Ridge, Tenn. is the heart of a new gage for measuring sheets of Pliofilm and other thin films developed at the Goodyear research laboratory, maintained in Akron, O., by the Goodyear Tire & Rubber Co. Perfection of the new device was announced by L. B. Sebrell, director of the laboratory, who also revealed that a comprehensive program employing radioactive isotopes for research in rubber and plastics has been launched under the direction of S. D. Gehman, head of physics research at the laboratory.

The new thickness gage, developed by W. E. Morris, research physicist, make it possible to gage a sheet of Pliofilm or other film continuously as it comes from the rolls and requires no mechanical contact with the film. In operation, the film passes through a slot in the gage. Below this slot there is a small amount of Carbon 14, and above is an ionization chamber in which is produced a minute electrical current by the beta rays or electrons emitted by the isotope. The number of electrons penetrating the film depend upon its thickness, and the meter can be graduated to read directly in thickness of film. Carbon 14 is one of the weakest of the radioactive isotopes, and for all ordinary purposes its radiations may be regarded as harmless. According to Dr. Morris, the new gage will read with accuracy to 0.0001-inch, and he expects to attain an accuracy of 0.00001-inch in the future.

Regarding work at the laboratory with



W. E. Morris Demonstrates New Film Thickness Gage

other types of radioactive materials Dr. Gelman said that radioactive phosphorus was being used to study the diffusion rate of plasticizers. Radioactive copper is being used to study the solubility of copper in rubber. Radioactive sulfur is now available in sufficient strength for use as a means of measuring the migration and solubility of sulfur in rubber and investigating the chemistry of vulcanization. Dr. Gehman also said that studies were being made to determine whether small amounts of uranium or thorium might be used as a means of identifying rubber products.

Hydrotherm Heating and Cooling of Calenders and Platen Presses

M ODERN plastics require closer temperature control than has been possible to maintain by the use of steam as a heating and cooling medium. These temperature requirements may be as high as 700° F., and cooling may be as low as 70° F. It is also desirable to maintain the temperature over the entire roll or platen surfaces within very close limits of even ±1° F. The different rolls in a calender require temperature differences of 5-100° F. or higher for proper plastic processing between rolls; while press platens should generally be maintained at a uniform tem-perature. Desirable higher production speeds and the production of sheets of uniform quality and thickness are obtainable only by uniform temperature control of

calenders and platen presses.

The use of steam alone for heating gives varying temperatures because of irregular distribution, pressure fluctuations, and condensate film, and falls far short of the ±1° F. tolerence over the entire surface of rolls or platens. For cooling, attempts have been made with steam of lower pressure and temperature, vacuum, injection of condensate, and even injection of cold water into rolls and platens. The use of steam for cooling, even under vacuum, does not permit uniform temperatures because of the difficulties in evacuating the condensate. Calculations show that effective continuous cooling by means of steam cannot be normally obtained.

The injection of condensate in a roll is not an effective cooling method because of the formation of uneven film thicknesses which prevent uniform heat transfer. The use of cold water is also unsatisfactory because of the stresses created by uneven heating and cooling effects on the metal parts and because of the formation of scale inside the rolls or platens.

The high temperature fluid system, Hy-

drotherm, designed by the American Hydrotherm Co., is claimed to solve the heating and cooling problems of calender and platen press operation. This system uses water up to 400° F. maximum temperature, and chemicals where higher temperatures are desired. The fluid is circulated in a closed system requiring practically no make-up, thus eliminating the formation of any scale or internal corrosion. The entire system contains only a high-temperature fluid producer, a cooler, pumps, piping.

valves, and controls.

The heat transfer rate obtainable with Hydrotherm is claimed to be much greater than with any other system and permits the employment of maximum processing speeds. Temperatures can be raised or lowered uniformly and at the desired rate and can be maintained within the ±1° F. tolerance. The Hydrotherm system is said to permit greater production speeds, wider usable sheet surface, greater temperature variations in the entering batches, longer runs without shutdowns, and more even quality in the product.

Golf for the Quebec Group

THE Quebec Rubber & Plastics Group held its final scheduled meeting of the current season on May 13 in the Legion Hall, Montreal, P. Q., Canada. After a lew brief remarks by Chairman A. S. Mc-Lean, British Rubber Co., the meeting got Lean, British Rubber Co., the intering got under way with the showing of two films on golf. A professional golfer from one of Montreal's clubs was present and addressed the group. The Group's annual golf tournament will be held at the Granby Golf Club, Granby, P.Q., on June 25. A business meeting to prepare a slate of officer candidates for the next season will be held in the near future.

Washington Engineers Election

THE Chemical Engineers Club of Washington held its average ington held its annual spring outing May 13 at the Bannockburn Country on May Club, Md. A blind bogey golf tournament was held in the afternoon, followed by an outdoor supper at the Club's bar-becue grounds. After supper a brief bus-iness meeting was held to elect officers for the coming year. The following slate of officers was presented by the nominating committee and approved by the membercommittee and approved by the member-ship: president, John T. Cox, deputy direc-tor, Office of Rubber Reserve; vice presi-dent, Philip H. Groggins, Burcau of Agri-cultural & Industrial Chemistry, United States Department of Agriculture; secre-tary, Randall D. Sheeline, chemical en-gineer, Navy Department; and treasurer, Paul S. Forsyth, technical assistant, Pol-ymer Development Branch, Department of ymer Development Branch, Department of Agriculture.

Summer Laboratory Clinics

ONTINUING its program to place the latest discoveries of experimental scientists at the service of industry, the Polytechnic Institute of Brooklyn will present its fifth annual series of summer laboratory clinics from June 7 to July 17.

(Continued on page 394)

RUBBER WORLD

NEWS of the MONTH

Highlights—

Further comments on the Rubber Act of 1948 were in favor of early impletion of the Act and the need of continuing a policy of cooperation and alertness of the administration of the law by the rubber industry. Business for the first quarter of 1948 was reported as somewhat less than for a comparable period last year, but the level of activity for the remainder of this year and for several years to come was again viewed

with general optimism by leading rub-ber company executives. The meeting ber company executives. of the Rubber Study Group in Washington, D. C., provided some interest-ing statistics on probable production and consumption of rubber in 1948 and 1949. Negotiations between the Big Four rubber companies and the URWA union on the subjects of company-wide contracts and/or wage increases were under way with each of the four companies individually by the first of

Short- and Long-Term Business Outlook Held Good; Study Group Estimates Rubber Use for 1948 and 1949

Executives of leading rubber companies in their annual reports to their stockholders stated that the production of rubber goods in 1948 might be somewhat than in 1947, but the outlook for 1948 and for the continued growth of the industry was good. Herbert E. Smith, president of United States Rubber Co., mentioned evidence of improvement in worker productivity and management-employe rela-tions. John L. Collyer, president of The B. F. Goodrich Co., said that the margin of earnings was narrower than for a comparable period last year. He explained that this condition was due to increased costs of both materials and payrolls without corresponding increases in selling prices, and also to the reduction in sales

The Rubber Manufacturers Association, Inc., in an analysis of the Rubber Act of 1948, urged manufacturers to be alert to the provisions of the Act and to the need of continuing cooperation and critical scrutiny of its administration. Mr. Collyer, in another statement, also urged early impletion of the Act and pointed out that "competitive enterprise—on both the national and international levels"—is a better guarantor of national security and technical progress than any system of prolonged governmental controls or international restriction schemes.

The Rubber Study Group issued a re-lease following its Washington, D. C., meeting estimating natural rubber production for 1948 at 1.391,000 long tons and for 1949 at 1,547,000 tons. Consumption of both natural and synthetic rubber for 1948 and 1949 was estimated at about 1,745,000 tons for each year.

Further Comments on Rubber Act

The Rubber Act of 1948. Public Law 469-80th Congress, was reproduced on this page in the May issue together with some brief comment. During the last month a detailed analysis of the Rubber Act by the R.M.A., and a study entitled Program for Preparedness in Rubber" by John L. Collyer, Goodrich president, the latter concerned with the early impletion of the Rubber Act, have been received.

The R.M.A. analysis states at the outset that the Rubber Act of 1948 is a compromise, and like all such legislation, it has no completely satisfied advocates. The Act has two provisions written into the law at the vigorous insistence of the industry: one is the strong and clear-cut statement of policy, and the other is the provision for a relatively nearby termination date.

The policy statement asserts the conviction of Congress that in rubber the nation's best and strongest security bulwark is unfettered competitive enterprise and has directed the government to terminate its controls over rubber, dissolve the patent pool, and get synthetic plants in the hands of private industry "whenever consistent with national security." The R.M.A. analysis points out that Congress recognizes the agreed position of the industry and the Armed Forces that controls must continue until an adequate security stockpile of natural rubber is accumulated, but it puts the government on notice that it must not delay beyond that date in the matter of terminating its controls and getting the synthetic rubber business into private

At the same time the policy declaration becomes the overriding guide in the interpretation of provisions looking to the relaxation of some existing controls and the disposal of government facilities, excess to the basic security block of plants, within the life of the Act.

Although by virtue of Executive Order No. 9942, under which the Act is now administered, the functions of Office of Rubber Reserve and Rubber Division, Office of Materials Distribution, United States Department of Commerce, are continued as before, a major change is possible in the near future. Such a change should result from the authority granted the President to consolidate all powers and functions granted by the law under a single agency, and this might well elevate the rubber office to a higher organizational status. (Effective May 7, Rubber Order R-1, will be administered by the Office of Domestic Commerce, Department of Com-The OMD has been merged with the ODC.)

The R.M.A. analysis then takes each section and subsection of the new law and attempts to explain possible actions that will result from the wording of the law based on past precedent and future conditions. It is emphasized, however, that official interpretations of legislation are made by the Attorney General and finally decided by the federal judiciary.

The Collyer study, called an analysis of the national and world rubber situation and the eleventh in a series the Goodrich company has issued since July, 1940, suggests six steps for consideration by the federal gov-

ernment:

(1) Immediate study of availability of all the components necessary to making American synthetic rubber again on a large scale . . . "to avoid serious con-flicts in an emergency, with other essential production programs which might require the same materials."

(2) Determination of types and quantities of rubber products that would be needed in an emergency, and the conditions under which such products would be required to operate "so that competitive development and engineering can be intelligently directed toward solution

of military product and supply problems."
(3) The framing of a "rubber mobilization plan" which, should war occur, would assure the rapid conversion of the industry to military and essential civilian production and the large-scale use of Amer-

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ican synthetic rubbers.

The increasing of current working stocks of American synthetic rubbers, and continuing additions to the strategic stockpile of natural rubber as supplies become available

(5) Early dissolution of the wartime patent pool in synthetic rubber a move that would at once turn the full power of competitive research and development to the improvement of existing rubbers and the invention of new, better and lower-cost rubbers."

(6) The exertion of the government's influence toward maintenance of a free world market in rubber and "against the resumption of cartels or other programs that would restrict natural rubber produc-

Mr. Collver pointed out that many of the study's recommendations concern the early impletion of the recently enacted "Rubber Act of 1948" and that the program was designed to help chart the most effective course for the nation, within that framework, in terms of (1) immediate security, (2) long-range security, and "a free and strong (3) development of American-rubber-making industry."

Rubber Goods Production Outlook

Statements made by executives of two leading rubber goods companies during the latter part of April in connection with reports to their stockholders, expressed confidence in the business outlook for the remainder of 1948.

Herbert E. Smith, told U. S. Rubber stockholders that sales for the first quarter of 1948 were within 7% of those for the same period last year, and on the basis of the present outlook the company expects to continue a liberal dividend policy. In analyzing the company's progress last year, which was indicated by a new high sales volume of \$\$81,000,000, Mr. Smith emphasized continued improvement in employe-management relations. stoppages in 1946 caused a loss of 1,269,000 man-hours of production; while in 1947 this loss was cut 43% to 725,000 mances each new law actions d future ver, that tion are d finally

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As evidence of improvement in worker productivity, it was stated that immediately following the war, productivity fell to 181/2 pounds of rubber processed per man-hour in the tire division. In 1947 this figure increased to 209/10 pounds per man-hour, a gain of 13%.

Commenting on the future, Mr. Smith foresees good business throughout 1948 and also long-term growth of the industry. Concerning the latter, he cited the

following factors:

Many products of the industry are basic necessities; use of rubber in the United States continues upward, having risen from less than one pound a person in 1910 to an average of 15 pounds a person last year; great expansion of the use of rubber in foreign countries, especially Europe and Asia; increasing competition between natural and synthetic rubber which will result in new and better products at lower

Another U. S. Rubber executive, Howard N. Hawkes, assistant general manager ard N. Hawkes, assistant general manager of the tire division, in a statement made in early May, declared that automobile tire replacement sales will continue at near record levels in 1948. He estimated that industry-wide passenger-car tire replacement sales for the April-September period would be close to 26,500,000 units, com-pared with 26,730,000 for the same period in 1947. Truck casing sales for the same six-month period are figured at about 4,-500,000 units, as against 4,860,000 for the peak six months of 1947.

With more than two million more cars now on the road than there were a year ago it is entirely possible that tire retail volume may exceed last year's figures, it was added. In addition, gasoline consumption, 22°c greater in 1947 than in 1941, will probably be even higher in 1948.

Mr. Hawkes also pointed out that any curtailment in new car production resulting from steel shortages would further en-hance tire replacement sales by placing greater reliance than ever on older vehicles which constitute the bulk of the tire market. Approximately 75% of the cars now in use are 1941 models or older, he added.

Mr. Collyer in his report to Goodrich stockholders on April 20 said that first-quarter sales of the company were 3.8% below those for the same period of 1947. He explained that the decline in sales had been mainly in the replacement tire divi-sion and reflected the replenishment, during 1947, of wartime-depleted inventories by dealers and manufacturers and also the severity of the past winter, which generally held down auto mileage.

It was also reported that the margin of

earnings was narrower than for the com-parable period last year. This smaller margin was attributed to increased costs of both materials and payrolls without corresponding increases in selling prices, and also to the reduction in sales volume.

The Goodrich company estimated that consumption of rubber in the United States in 1948 would amount to 940,000 long tons, or 16% below the 1,122,000 tons consumed in the record year, 1947. Of the record 1947 total, 55,000 tons, or 5%, represented increases in manufacturers' inventories and was not reflected in sales, it was explained.

In Akron, O., is was reported late in April that tire manufacturing divisions at the Goodyear, Firestone, and Seiberling companies were returning to a six-day production week to prepare for the expected increase in demand for tires during the summer months. Of course if strikes in the automobile industry curtail new

car production, some of this increased tire production may be cancelled.

Production, Sales and Inventory Figures

The Department of Commerce, through its Office of Business Economics, is currently engaged in a comprehensive program of revision of the estimates and indexes published in its Monthly Industry Survey. Some data in the February-March, 1948 issue of the survey taken from these re-vised estimates for rubber products are listed below, together with comparable data for chemicals and allied products. It is explained that the new estimates differ from the old in that they use weights based on 1939-41 data of the Bureau of Internal Revenue as published in Statistics of Income, with an adjustment for un-incorporated manufacturing concerns. As a result, the dollar values of sales and inventories are considerably higher than old figures based on the 1939 Census of Manufacturers.

Estimates of Manufacturers' Sales and INVENTORIES REVISED SERIES (Millions of Dollars)

		Rubber roducts	Chemicals and Allied Products		
Period	Sales	Inventories	Sales	Inventories	
1941	1,072 1,154 1,686 3,267	225 265 306 434	4,339 4,858 6,546 10,750	817 875 1,231 1,726	
Jan Feb Mar Apr May June July Aug Sept Oct	279 279 307 296 286 287 276 288 308	477 501 526 562 581 577 558 537 512 513	1,133 1,193 1,195 1,212 1,148 1,099 1,053 1,079 1,192 1,313	1.833 1.887 1.924 2.006 2.054 2.025 2.000 1.988 1.950 1.927	
Nov Dec	303	504 535	1.141	1,974 2,064	
Year 1948	. 3,528	535	13,845	2,064	
Jan Feb	261	563 587	1,205 1,136	2,084 2,126	

The R.M.A. regular monthly report on tire and tube production reported the output of passenger-car tires in March as 10.4% higher than in February. Production of truck tires during March was 1.1% lower than in February. The production figure for passenger-car tires was 5,640,-221, against 5,109,722 in February, and for truck tires was 1,261,424, against 1,-275,672 for the previous month. Full de-tails including shipments of both tires and tubes will be found in the section on statistics in this issue.

The report of the Department of Commerce on consumption, distribution, and stocks of rubber according to type for March (preliminary figures) showed consumption as: natural, 54,230 long tons (including 2,135 tons, dry weight, of latex); GR-S, 29,713 tons; neoprene, 3,127 tons; Butyl, 4,736 tons; and nitrile types,

New supply and production for March were: natural, 72,070 tons (including 3,193 tons, dry weight, of latex); GR-S, 37,877

tons; neopreue, 3,086 tons; Butyl, 4,366 tons; and nitrile types, 380 tons.
Stocks on hand on March 31 were: natural, 130,217 tons (including 8,045 tons; dry weight, of latex); GR-S, 50,444 tons; neoprene, 5,212 tons; Butyl, 14,492 tons; and stirile pages, 2628 terms. and nitrile types, 2,628 tons.

Rubber Study Group Meeting

At the conclusion of its fifth meeting held in Washington, under the chairman-ship of Donald D. Kennedy, chief, Division

of International Resources, U. S. Department of State, the Rubber Study Group issued the following press release:

"The meeting was attended by delegates from Australia, Belgium, British Colonies, Burma, Canada, Ceylon, Czechoslovakia, Denmark, France, Hungary, Italy, Liberia, Netherlands, United Kingdom, and the United States, and observers from the United Nations Food and Agriculture Organization, Pan American Union, and the International Rapk for Pagametrical and International Bank for Reconstruction and Development.

"The vice chairmen of the meeting were G. C. S. Corea of Ceylon and Denis Harvey of Canada.
"The principal objects of the meeting

"1. To examine the statistical position regarding production, consumption, and stocks of rubber throughout the world;
"2. To review the world rubber situation in the light of the changes in that position in the fourth Study Group meeting, held since the fourth Study Group meeting, held in Paris in July, 1947.

"3. To consider measures designed to expand world consumption.

1. The Group examined the statistical position and made estimates for natural rubber production and the total consump-tion of natural and synthetic rubber dur-ing the years 1948 and provisionally for 1949. During 1948 it was estimated that world production of natural rubber would be in the neighborhood of 1,390,000 tons: while total consumption of natural and synthetic rubber might be in the region of 1,745,000 tons, of which about 1,310,000 tons would be natural rubber. In regard to 1949 it was estimated that natural rubber production would be of the order of 1,550,000 tons; while total consumption natural and synthetic might again be 1.745,000 tons.

"The Group felt the need for projecting its estimates beyond the current year, but the figures for 1949 should be treated with the greatest caution.

"2. There was an exchange of views on the subject of the price of natural rubber. The discussion covered the field of commodity agreements, government control of the sale and purchase of natural rubber, and special arrangements for the pur-chase of natural rubber by Governments from Governments for stockpiling at fixed

"The Group reached the conclusion that the time had not yet arrived for any consideration or examination of a commodity

agreement.
"3. The Group continued its policy of examining all means for encouraging the expansion of the world consumption of rubber.

"It considers that every effort consistent with national security requirements should be made to ensure the exchange and trad-

ing in rubber should be freed.

"It again expressed the hope that maximum assistance would be given to the countries desiring to make an extensive use of rubber, but which, on account of the war, cannot afford to pay in foreign currencies for the rubber imports they re-

"The Group is of the opinion that only by a sustained and continued expansion of its use can the problems of rubber be permanently solved and that all welldirected efforts towards that end should

be supported and encouraged.

"The Group accepted an invitation from
the Government of the United Kingdom
to hold their next meeting in Kuala Lumpur, in the Federation of Malaya, early

"The British Colonies, Ceylon, France, the Netherlands, the United Kingdom, and the U.S. A. were appointed to form the

management committee."

The estimates of the Rubber Study
Group for natural rubber production, naand synthetic rubber consumption. and the production and consumption of natural rubber latex for the years 1948 and

1949 follow:

ESTIMATED NATURAL RUBBER PRODUCT

Territory 1948	
	1949
Malaya 675	700
Indonesia	460
Ceylon	90
Indo-China	80
Diffusion Loringo	65
Existing accessing	12
4,100110 ,	27
Other countries 113	113
Total 1,391	1,547

CONSUMPTION CONSUMPTION

				1949
	Natural	Synthetic	Total	Total
U.S.A	576	392	968	917
U. K	2015	5.9	216	225
France	93	9	102	117
Netherlands .	12		12	14
Belgium	-		17	17
Czechoslovakia		*	16	16
Italy	-		28	30
Lenmark	-		4	
Hungary	-		3	4 3
Australia	*		24	25
Canada	33	20	5.3	49
Other countries			308	330
TOTAL			1.745	1.747

Synthetic consumption not given separately; total synthetic consumption for all countries so indicated is estimated at around 7,000 tons,

With regard to natural rubber latex. the Group estimated that the potential production for 1948, provided the increasing output is justified by the demand, might be around 70,000 tons (dry rubber content)

The following estimates for 1948 consumption of natural rubber latex were given: U. S. A., 28,400 tons: U. K., 10 to 12,000; France, 5,000; and other countries, 10 to 12,500. (All figures, tons dry rubber

Lockwood's May 15 Rubber Report called the Washington Study Group meeting a study in contrasts and pointed out one clear fact that emerged from the conversations-i.e., out of the 80,000-ton surplus of expected production over expected consumption of natural rubber in 1948, there will not be much natural rubber for U. S. A. stockpiling if any nation other than the United States also does much stockpiling.

It was also noted that government agencies are not in favor of higher government production of GR-S or higher mandatory use until present excess production (running between 4.000-5,000 tons monthly) is used voluntarily. Certainly government production should not be available as a price lever, but there may be justification in allowing manufacturers a somewhat higher working inventory of GR-S than the present 20-day limit, it was added.

Rubber Teck, a new rubber company operated by Paul A. Karres and Joseph Kerley, has taken over the interest of Green's Rubber & Machine Works, 19115 S. Hamilton St., Gardena, Calif. The new company will continue at the same location will manufacture a general line of molded rubber goods.

Labor Relations News

Activity in the field of labor relations was on a high level during recent weeks and promises to continue for some time to come. Firestone Tire & Rubber Co., the only one of the Big Four not having a company-wide contract with the United Rubber Workers, began a discussion of such a contract with the union in late April. The URWA bid for negotiation of a third round of wage increases on an industry-wide basis was rejected by Big Four management. Wage talks and discussion of a new company-wide contract between Goodyear and the union began in Cleveland on May 10, and wage talks between Goodrich and the union began in Philadelphia on May 24, and were sched-uled between U. S. Rubber and the union on June 1 in New York. Wage talks between Firestone and the union are expected to follow conclusion of the negotiations for company-wide bargaining. Seiberling Rubber Co., on May 17, signed an agreement with the URWA providing for paid holidays and checkoff of union dues, and the new contract includes an arbitration clause. Some dissatisfaction within the URWA both at the national and local level may become aggravated or disappear, depend-ing on the result of the campaign for a 30c-an-hour wage increase.

Wage and Contract Negotiations

It was announced in late April by the Big Four rubber companies that they did not wish to bargain with the URWA on the wage increase question on an industry-Negotiations were therefore scheduled independently, Goodyear Tire & Rubber Co. began its discussion of the wage increase in Cleveland, O., with the union on May 10. The B. F. Goodrich Co. discussions with the union began in Philadelphia, Pa., on May 24, and United States Rubber Co. and the union were scheduled to start their talks in New York on June 1. Firestone began negotiations in Cleveland before May 1 on the subject of a companywide contract, after which the wage question was to be discussed.

In its original demand for a 30c-an-hour wage increase the union had indicated that a portion of this increase, if granted, would be used to set up a health and welfare program for union members. It was reported that the Union Casualty Co. of New York had worked out a program for the union and would assist the latter in its negotiations with the companies.

It has also been reported that the success of the present international rubber union president, L. S. Buckmaster, in obtaining a 30c-an-hour wage increase or a sizable portion thereof will have a bearhis remaining in office. Certain elements in the union are in favor of a more aggressive policy by the leaders of the union, and Mr. Buckmaster is criticized for his conservative handling of management-labor negotiations.

There was no information available near the end of May as to the results of these negotiations between the Big Four and the

Sun and Seiberling Labor Notes

The Sun Rubber Co., Barberton, O., was closed by a strike of its 1,225 workers on May 8. The local union president stated that the principal cause of the strike was the inability of the union and the company to agree on severance pay and union shop issues. A new contract which had been in the process of negotiation since December 31 was rejected by the union.

The Seiberling Rubber Co., Akron,

signed a new contract agreement with the URWA on May 17. Retroactive pay for last Labor Day, Thanksgiving, Christmas, and New Year's was granted as was future pay for these holidays. An impartial umpire system and the checkoff of union dues were included in the contract. wage increase demand was left unsettled until an industry "pattern" is established.

R-1 Revised Again

Revision of the Department of Commerce Rubber Order R-1, to bring it into conformity with the Rubber Act of 1948 (Public Law 409), passed by Congress March 31, was announced May 7 by H. B. McCov. Director of the Office of Domestic Commerce. Principal feature of the revised order is reversal of the specifications for manufacture of tires, tubes, flaps, and camelback, from a maximum natural rubber basis to minimum synthetic rubber This reflects the intent of the new legislation to assure consumption of synthetic rubber in quantities sufficient to maintain a domestic rubber producing industry adequate for national security and to allow for continued stockpiling of natural rubber by the government.

Since cessation of hostilities the old WPB conservation order has been progressively amended with these ends in view, and the new changes do not alter recent requirements for use of specified preparations of synthetic rubber in the manufacture of transportation items, officials said. Control over synthetic rubber content of these items merely becomes direct rather than indirect, they explained. It also was pointed out that specification formulae now are written in terms of synthetic and new rubber only, not total rubber content as formerly, and so do not affect current reclaimed rubber usage.

Removal of the last remaining control over natural rubber latex is effected by deletion from the order of specifications requiring use of some synthetic in the man-

ufacture of certain sizes of seat cushions. Effective May 7, the rubber order is being administered by the Office of Domestic Commerce. For the previous 12 months it had been the responsibility of the Office Materials Distribution, now merged

with ODC. Mr. McCoy previously was director of both Offices.

Then on May 26, Mr. McCoy announced further amendment of R-1, removing maximum of Rmum inventory limitations on GR-S and extending the area of mandatory use of GR-I in making inner tubes. Mr. McCoy explained general-purpose synthetic rubber will remain under allocation, but production is now sufficient to permit manufacturers to accumulate normal inventories. For the past three months inventories had been held to amounts sufficient to provide not more than 20 days' supply. Officials said the relaxation will provide more rubber to distribution channels and hoped removal of inventory control would result in greater voluntary use of GR-S in the interests of

ational security. Broadening the base of mandatory use of Butyl to include medium-size truck and bus inner tubes, without requiring additional total consumption of the synthetic, will permit manufacture from natural rubber of up to 20% of all tubes in each size group. Thus manuafcturers will be able to supply natural rubber tubes to northern areas of the nation where some Butyl tubes have been adversely affected

by low temperatures.

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Reassignments of field representatives in various sales groups have been announced by Enjay Co., Inc., chemical products marketing affiliate of Esso Standard Oil Co., 15 W. 51st St., New

Standard Oil Co., 15 W. 51st St., New York 19, N. Y.
In alcohols and chemicals (Petrohol) sales, John E. Devine, Midwest division manager, and Charles L. Brooks move to New York headquarters from Chicago; while Robert A. Short joins the Midwest division from the Philadelphia area, where he is succeeded by Norman C. Baker, formerly of the Metropolitan. G. Baker, formerly of the Metropolitan New York sales staff.

In the rubber sales group, W. A. Fair-clough transfers to the Chicago office from the New York Metropolitan district, to concentrate on West Coast activities.

T. Curry Jones joins the New York staff in lubricant and fuel additives (Paramins) sales to assist A. B. Boehm,

Mr. Devine has been with Standard Oil Co. (N. J.) affiliates in the marketing of alcohols and other chemicals derived from petroleum since 1924. After four years with the Chemical Warfare Services with the Chemical Warfare Services and the standard of th

years with the Chemical Wartare Serverce during the war, he was placed in charge of the Midwest division in 1945.

Mr. Brooks joined Standard Alcohol Co., predecessor of Enjay Co., Inc., in 1939 as a technical representative. During the war he served in the Army Air Egree. Force.

Mr. Short, following three years with the U. S. Navy Bureau of Ordnance, joined Enjay in 1946 as a technical rep-

Mr. Fairclough has been with Enjay and another of its predecessors, the chemical products department of Stanco Distributors, Inc., as a technical representative on rubbers and resins in the New York Metropolitan area since 1943. He holds memberships in the American Chemical Society and the Rubber Groups of Los Angeles and Chicago and has contributed to a number of papers read before American Chemical Society meetings.

On graduating from college, Mr. Jones was employed by the Standard Oil Development Co., working on petroleum manufacturing processes. Following two years of destroyer duty with the U. S. Navy he returned to the development company and worked on petroleum ad-

The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., in an effort to improve existing unsatisfactory tire inflation conditions has launched a "Correct Tire Pressure" campaign. This consists of a message to tire dealers and service station personnel de-scribing the millions of dollars of waste in premature tire failures from incorrect inflation and detailing what they can do to overcome this and simultaneously build customer good-will. The basis of the campaign is a two-color display chart con-taining the correct tire inflation for all makes and models of automobiles, as re-commended for original equipment tires by the automobile manufacturers and the

Mace New Pequanoc President



Thomas N. D. Mace

At a recent meeting of the board of directors of the Pequanoc Rubber Co., Butler, N. J., Thomas N. D. Mace was elected president to succeed Frederick E. Traflet, who resigned because of poor health. Mr. Traflet will remain with the company, however, as vice president of the sales division.

Other officers include Miss M. T. Gunter, secretary-treasurer, and Newton T.

ter, secretary-treasurer, and Newton T. Tuthill, assistant treasurer.

Mr. Mace is the third president of the Pequanoc company, which was founded by the late, Joseph F. McLean in 1901. The new chief executive joined the rubber reclaiming company 20 years ago as a mechanical engineer, coming from Farrel-Birmingham Co., Inc., Ansonia, Conn. He became assistant superintendent of Pequanoc a few years later and superintendent in 1939. Mr. Mace also has been active in civic affairs in Butler and after serving six civic affairs in Butler and after serving six years on the Borough Council was elected mayor in 1942 and again for a third term in 1946.

Pennsylvania Rubber Industry Expansion

More than \$7,300,000 will have been More than \$7,300,000 will nave been invested since the war in new plants and equipment in Pennsylvania by 12 rubber companies, it was shown in an industrial survey whose results were announced by Governor James H. Duff and Secretary of Commerce Orus J. Matthews. This expansion is provided by a program to talking program. sion is part of a program totaling more than two billion dollars reported by 1,086 than two billion dollars reported by 1.086 companies participating in the survey for the years 1946, 1947, and 1948. The expansions for the three-year period by seven rubber goods companies follow: 1946—\$918.292; 1947—\$1,120.880; 1948—\$280,000; total—\$2,319,172. The corresponding expansions by five rubber tire and tube companies were: 1946—\$3,066,678; 1947—\$1.091,641; 1948—\$910,000; total—\$5,068,310 tal-\$5,068,319.

The Glenn L. Martin Co., Baltimore 3, Md., has appointed Walter W. Peacock, Md., has appointed Walter W. Peacock, Jr., technical sales representative for its chemicals division. His territory will be New England and New York, N. Y., for the marketing of the new Marvinol VR-10 vinyl resin and other products of the division. He was with the Stanley Chemical Co., East Berlin, Com., for the past two years, aiding in development of vinyl organosols for the coated fabrics field.

Prior to that time he had been a lieutenant colonel in the Army Ordnance Department. Mr. Peacock holds a B.S. degree

partment. Mr. Peacock holds a B.S. degree from Bowdoin College.
Wesley S. Thurston has been added to the public relations staff of the Martin company. Mr. Thurston was for two years director of public relations for the Society of The Plastics Industry. Inc., New York, N. Y. Prior to his SPI work he had been a public relations officer in Army Air Forces. Mr. Thurston will work close by with the Martin chemicals division and ly with the Martin chemicals division and its products. He will report to Richard W. Darrow, director of public relations for

the company.

Latex Distributors, Inc., 80 Broad St., New York 4, N. Y., has concluded arrangements with Socfin Co., Ltd., of Malaya, to sell its liquid *Herea* latex in America. Socfin is one of the world's leading producers of natural rubber and palm oil and, as part of the Société Financiers des Court. as part of the Société Financiers des Caout-choucs, is affiliated with companies in Indo-China, Java, Sumatra, and Africa. Socfin has been converting its solid rubber output into specialized types and bringing large rubber acreages into liquid latex produc-tion. The company is spending more than \$1,000,000 in Malaya alone for latex facilities and expects to be the first new producer to bring bulk centrifuged latices to America since the war. While most of its liquid latex production will be in the form of high-quality centrifuged concentrate, Sociin will also produce other required types, such as creams, multi-puri-fied, and concentrated types. The first shipments of latex by Socfin are expected to reach this country during the third quarter of this year and will arrive at Balti-more, Md., where bulk unloading, storage, and handling facilities will be provided by Latex Distributors, together with an office and laboratory. The facilities at Baltimore will be among the most modern in the world, according to Latex Distributors.

Present plans also provide for ultimate expansion of the underground concrete tankage to make one of the largest latex depots in the world.

The Borden Co., 350 Madison Ave., New York 17, N. Y., has announced the amalgamation, effective May 1, of its Casein Co. of America and Durite Plas-Casein Co. of America and Durite Plastics divisions under the single name of the chemical division, Borden Co. This move was made as a result of the Casein Co.'s expansion in the field of synthetic resins and associated chemicals, together with the widening activities of the Durite Plastics division. Operations of the new division will continue from the same head-marters as in the past and products will quarters as in the past, and products will be marketed under the Casco and Durite trade marks. Personnel and management remain unchanged, with the following divisional officers: president, William F. Leicester; executive vice president, F. E. Novotny; and vice presidents, Nils Anderson, Jr., H. P. Fell, C. S. Leonardson, and Ernest E. Novotny.

St. Joseph Lead Co., 250 Park Ave., New York 17, N. Y., has announced that Irwin H. Cornell has retired as vice president and sales manager of the company, but he will remain a member of the board of trustees and executive committee. Mr. Cornell started as assistant to the president on January 1, 1910, became secretary of the company in 1911, a trustee in 1913, and vice president on February 5, 1915. He was secretary of the Lead Committee during the first World War and resigned from St. Joe in 1918 to become Lead Commodity Chief of the War Industries Board. In January, 1919, he returned to St. Joe as vice president and sales manager. During World War II. Mr. Cornell served on various metal industries' advisory committees of the WPB and the OPA.

and the OPA.

Charles R. Ince has been appointed sales manager to succeed Mr. Cornell. Mr. Ince attended Columbia University and joined the company in 1929 as assistant to Mr. Cornell. In his new position Mr. Ince will be assisted by Malcolm Bonynge and Dwight Marshall. Mr. Bonynge has been with St. Joe since 1930; while Mr. Marshall joined the company in 1934.

Baldwin Locomotive Works, Philadelphia, Pa., is completing a new 4,800-ton hydraulic press for vulcanizing large rubber conveyer belts for delivery to Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. Engineered and built by Baldwin at its Southwark plant at Eddystone, Pa., the press is approximately 13 feet high, nine feet wide, and 53 feet long and is designed for a working pressure of 2,500 p.s.i.

Pennsylvania Salt Mfg. Co., special chemicals division, Philadelphia, Pa., has appointed William D. Wilson district sales representative in northern New Jersey and New York, N. Y. Before joining Pennsalt last January, Mr. Wilson had been a chemist with the McCormick Rubber Co., Ridgefield Park, N. J., for 11 years and with Curtis-Wright, Caldwell, X. J., for six years.

Ivan D. Hagar, since July, 1937, vice president of Titanium Pigment Corp. and assistant manager of the titanium division of the National Lead Co., both of 111 Broadway. New York 6, N. Y., has retired after 27 years with National Lead. He will continue his affiliations with the company in a consulting capacity. Mr. Hagar joined Titanium Pigment in 1921 as a salesman. He became eastern sales manager in 1931 and in 1936 was elected to the board of directors. Five months later Mr. Hagar was appointed eastern sales manager of National Lead's titanium division and was elected a director of Titanium Pigment. Mr. Hagar has moved his residence from The Glen, Cotswold, Tenafly, N. J., to R.F.D. No. 2, Middlebury, Vt.

Rodic Rubber Corp., New Brunswick, N. Y., has appointed Harry F. Lea, of Buffalo and Charles W. Thomas, Philadelphia, sales representatives. Mr. Lea will be in charge of supplying and servicing industrial rubber products in northwestern Pennsylvania and western New York districts; while Mr. Thomas will execute the same duties in eastern Pennsylvania, Delaware, Maryland, and Washington, D. C.



Kaiden-Kazanjian

John F. Stiff

Binney & Smith Co., 41 E. 42nd St., New York 14, N. Y., is transferring John F. Stiff from the technical service division, where he has been the past two years, to the sales department, and he will be responsible for a new Binney & Smith office at 3329 Ridge Rd., Lansing, Ill. His territory will include most of Indiana. Wisconsin, Michigan, and Illinois except for Metropolitan Chicago, which is still being covered by Robert Cary, of the company's Chicago office at 228 N. LaSalle St. Mr. Stiff received a B.S. in chemistry from Massachusetts Institute of Technology in June, 1939, and was a paint chemist with Pittsburgh Plate Glass Co. for three years. During the war he was with Army Chemical Warfare Service doing research and development work on protective equipment at M.I.T.

New York Belting & Packing Co., Passaic, N. J., has appointed Ray Caldwell representative for the company's northeast district, embracing New England, Metropolitan New York, northern New Jersey, and eastern Pennsylvania. A graduate of New York University, Mr. Caldwell has held positions with Bendix Aviation Co., Western Electric Co., Quaker Rubber Corp., and Barr Bros. In his new position he will have headquarters in New York, N. Y.

Clemen J. Ehrlich, formerly counsel and sales director for Rubber & Plastics Compound Co., Inc., has opened offices for the practice of law at 475 Fifth Ave., New York 17, N. Y.

Frederick D. Rossini, chief of the Section on Thermo-Chemistry and Hydrocarbons, National Bureau of Standards, spoke on "Fractionation Analysis and Purification of Hydrocarbons" before a recent meeting of the research, process development, and engineering personnel of Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J. Dr. Rossini described in detail the distillation, extraction, adsorption, and crystallization methods used for the isolation and purification of hydrocarbons, using diagrams and photographs to illustrate the equipment used in this work.

Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y., has au-thorized the Vulcan Copper & Supply Co., Cincinnati. O., to design and erect units developed by Socony to produce ethylene and additional basic materials for the chemical and other industries. Known as Thermofor Pyrolytic Cracking, the process utilizes low-grade petroleum and residual oils. Ethylene, an important raw material used extensively in the manufacture of synthetic rubber, various plastics, al-cohol, detergents, and tetraethyl lead, has heretofore been obtained from petroleum as a by-product requiring expensive separation processes. The TPC process is essentially a high-temperature conversion accomplished without the use of a catalyst by contacting the oil charge with a moving bed of inert granules raised to a high heat. This action vaporizes the oil and induces rapid high-temperature reaction, and the resultant unsaturated gaseous hydrocarbons consist primarily of ethylene. The process is said to be suitable also for the manufacture of certain aromatic hydrocarbon compounds.

Pennsylvania Rubber Co., Jeannette, Pa., has appointed James M. Hughes assistant sales manager. He assumes his new position after 12 years of sales and operating experience with Goodyear Tire & Rubber Co., which he joined after his graduation from Michigan State in 1936. Mr. Hughes will be assistant to R. B. Cave, Pennsylvania vice president and sales manager, in tires, tubes, and athletic goods sales.

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., has announced that its executive and finance committees have approved and submitted to the board of directors for ratification a plan for a \$30,000,000 expansion of research facilities at the company's Experimental Station. This is the largest single laboratory project the company has ever undertaken and will make the Station, birthplace of nylon, neoprene, and other products, one of the largest research establishments in the world.

Construction plans call for 10 new laboratories and semi-works buildings for long-range research and development work. There are also to be 13 new service buildings, and existing laboratory buildings for nylon and other products will be enlarged. When the expansion is completed, the company expects to have 900 technical employes engaged exclusively in research work at the Station, of whom about 200 will be transferred from other laboratory locations. The total of all employes there, both technical and non-technical, will approximate 2,500. The major part of the plan for the expanded Station calls for construction of an entirely new section on 55 acres of the adjacent Du Pont Country Club. The entire job, including work on new and existing buildings as well as outside work, is to be finished in approximately 2½ years.

Miss Evelyn Winifred Anderson and Dr. Henry F. Palmer recently announced their marriage in Washington, D. C., on February 28. Dr. Palmer is a well-known consultant to the rubber industry. Mrs. Palmer had been secretary to the late G. L. Roberts at Rubber Reserve and prior to her marriage was secretary to Senator E. D. Millikan, of Colorado.

U. S. Rubber Personnel Changes and Recent Development

United States Rubber Co., Rockefeller Center, New York 20, N. Y., recently opened its new office and warehouse building at (125 Peeler St., Airlawn Industrial Fark, Dallas, Tex., which now will house all departments of the company operating in Texas. H. B. Pixley, operating manager at Dallas, is resigning and will be succeeded by R. W. Goodfellow, transferred from Seattle, Wash.

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A U. S. Royal Tires sales office has been reopened in the company's branch building at 1427 X. Water St., Milwaukee, Wis., to facilitate tire distribution in eastern Wisconsin and the Michigan upper peninsula. C. K. McNay has been appointed Milwaukee district manager. Mr. McNay, formerly assistant district manager at Chicago, has been with the company since 1941. He has also served as assistant superintendent of a wartime munitions plant in Des Moines and manager of commercial sales at the U. S. Tires branch in St. Louis.

Harry W. Brown has been appointed sales manager of U. S. Rubber's automotive department, to succeed S. E. Abramson, who retired after 51 years of service. Associated with the rubber industry for 23 years, Mr. Brown has held various sales positions with the company since 1937. In his new post he will have general supervision over the sale of several hundred automotive parts and will be stationed at the company's Ft. Wayne, Ind., plant.

The appointment of E. J. Briske as Detroit district manager of the company's automotive department was also announced. Mr. Briske has been with the company since 1927 and in recent years served as an assistant to Mr. Abramson.

Arthur C. Tharp has been made Milwaukee district sales manager of the mechanical goods division, succeeding Paul A. Bigby, resigned. Mr. Tharp, with the company since 1936, has held various sales positions in Chicago and Dayton and most recently was a salesman in the Milwaukee branch. He is a graduate of Culver Military Academy and Purdue University.

The wire and cable department has appointed Howard H, Weber chief engineer of the department and A. S. Basil general sales manager. Mr. Basil has been with the company since 1926, and Mr. Weber since 1934.

Other changes announced by C. W. Higbee, manager of the department, follow: H. J. MacDonald, assistant to the manager; H. F. Johnson, assistant general sales manager; R. A. Walker, merchandise manager; J. A. Leuver, assistant sales manager in charge of distribution; D. B. Karlskind, assistant sales manager in charge of commodities, sales engineering, and new projects; G. E. Hubrig, sales manager, western division; C. A. Bartron, chief sales engineer; A. E. Aune, manager, automotive and aircraft wire sales; and R. C. Cassidy, manager, Uskon sales.

Manager, Uskon sates.

William D. Carter has been appointed superintendent of Seaboard Mills, Burlington, X. C., according to Donald Carroll, manager of the Seaboard and Scottsville, Va., plants of the rubber company's textile division. Mr. Carter has joined U. S. Rubber with 33 years' experience in the textile industry.

Herbert E. Smith, president of U. S. Rubber, is Manhattan chairman of the committee to solicit concerns in the Greater

New York Fund's 1948 campaign to raise \$8,000,000 in behali of 423 local hospitals, health and welfare agencies. Charles Heitzman and Wm. M. Dougherty, executive assistant and assistant, respectively, to the president of the rubber company, are serving as vice chairman and committee member, respectively, of Mr. Smith's committee.

New Products Announced

Charles J. Durban, assistant director of advertising, U. S. Rubber, has been elected president of the American Television Society.

A new conveyer belt which will move more than 700 tons of iron ore per hour has been installed in a mine operated by the Cleveland Cliffs Iron Co. near Hibbing, Minn. Designed and produced in the Passaic, N. J., plant of U. S. Rubber, the 2300-foot belt is used to carry ore from the bottom of the pit to storage bins outside the mine and replaces a rail haulage system formerly used. The belt is a new type recently developed by the rubber company which is said to have two and one-half to four times the strength of conventional belts. The belt is reinforced with a special belting fabric, Ustex-nylon, which preserves high strength, lighter weight, and increased flexibility. The special belt was required because of the steep slope and the heavy weight of the material to be carried.

U. S. Rubber has announced that it is ready to begin full-scale production of aluminum bore hole and mine entrance cables which permit a 30 to 50% saving in cost and a 50% saving in weight over equivalent copper cables. Both types of aluminum cable, recently installed in several Alabama mines, have successfully passed all tests. The cables are covered with a neoprene compound which resists mine acids and oils and, because of their lighter weight, can be handled readily without the need of elaborate equipment. Both types of cable are made in various sizes ranging from AWG #6 to 1,000,000 cm. Mechanical connectors and solders recently developed make it possible to splice and connect the aluminum conductors as efficiently as copper.

A new corrosion-proof plastic pipe has been developed by U. S. Rubber for use in chemical manufacturing, mining, and other industries. The pipe is made of the company's Kralite, a blend of synthetic rubber and thermoplastic resins. It will be supplied in rigid and semi-rigid forms in sizes ranging from one-quarter to two inches outside diameter and may be bent to various radii and threaded for fittings. The pipe is made by a continuous extrusion process, and no metal or fabric reinforcement is used in the construction. While more expensive than most types of metal pipe, the new plastic pipe is expected to gain widespread use in many industries because of better resistance to chemical corrosion and to weather.

U. S. Rubber has developed a new plastic cutting block which has the strength of wood, it is claimed, but which will not split under the blows of a lumberjack's ax. Also made of Kralite, the cutting block is used on a guillotine-like machine fitted with steel dies to cut shoes, handbags, clothing, and other products out of leather, fabric, and paper. Most cutting blocks in the past have been made of wood slabs set on end and bonded together. The new plastic block has no grain and

will not chip or split under the impact of the cutting dies, according to R. D. Gartrell, development manager of the company's Passaic, N. J., plant. The Kralite block is said to outwear wood and to provide a better cutting surface for extremely fine materials, such as nylon and rayon.

Rugback, a white liquid rubber for painting the backs of rugs, has been announced by U. S. Rubber. According to John P. Coe, vice president and general manager of the company's Naugatuck Chemical division, where the product was developed, the material performs three functions: it anchors the loops of hooked rugs and prevents the tuits from pulling out; it helps prevent accidents by eliminating skidding of any rug; and it makes rugs lie flat without curling. The liquid backing material dries in an hour to form a tough, transparent film which does not come off on the floor, remains permanently flexible, and it is further said to lengthen the life of the rug. Since the film is waterproof, rugs coated with Rugback require no special care in laundering. The product is to be distributed directly to rug manufacturers, and to retail stores through an agent, John Dritz & Sons, New York. A pint of Rugback is enough to cover 30 to 42 square feet of rug surface.

Velvomat, a new type of floor covering for automobiles that can be formed in one piece if necessary and used without binding, has been developed by U. S. Rubber. Luxurious in appearance and practical in use, the material is also said to have many advantages for bus, railroad, and airplane floor covering. The material can be swept, vacuum cleaned, or washed and because of its non-slip feature brings greater safety to inclined walkways, stairways, and other locations. In the manufacture of Velvomat a luxurious-looking pile, which can be varied in thickness, weight, and pattern, is built up on burlap, fabric, or rubber. The material can be produced in many colors and has been shown by tests to have great durability.

The Gillette tires division will soon market a new low-pressure automobile tire to be known as the President, it was announced by H. C. McDermott, Gillette sales manager. The new tire, which will incorporate the riding and safety qualities of low-pressure construction, will sell for approximately 18% more than the company's first-line Gillette Ambassador tire.

Paul J. Elrod, chief chemist of Robbins Tire & Rubber Co., Tuscumbia, Ala., recently resigned to help organize the newly formed Muscle Shoals Rubber Products Co. at Florence, Ala.

H. W. North Co., Erie, Pa., manufacturing engineer and designer of mixing and processing machinery, has appointed D. W. DuVall eastern sales manager, with headquarters at 526 Highland Ave., Upper Montelair, N. J.

West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y., held a director's meeting on May 19 at which Sidney M. Phelan, Jr., vice president in charge of sales was advanced to first vice president; Lawrence Kavanagh, assistant treasurer, was advanced to treasurer, succeeding David Graham, resigned; and Joseph M. Wafer, general manager of the industrial chemical sales division, was elected a vice president and a director.

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ORLD

June, 1948

Hewitt Rubber Division, Hewitt-Robins, Inc., Buffalo 5, N. Y., has developed a new lose which made it possible for the world's first liquid propane gas tanker to operate in coastal service. The hose was made for the tanker SS Natalic O. Warren which transports the liquefied gas from Houston, Tex., to Newark, N. J. Specifications called for a hose that could withstand high working and test pressures, and the Hewitt hose has stood up under every test and condition to which it has been imposed since the ship was put into service early in April. The new hose has a maximum working pressure of 250 p.s.i., is able to withstand a hydrostatic test of 500 p.s.i., and is the first hose built to transfer liquid propane gas at extremely high rates of flow approaching 5,000 barrels an hour. Hewitt Restioam Division also has an-

nounced that a new, odorless, 100% pure natural latex foam mattress will soon be moving off its production lines. The new mattress, a development of the Hewitt Comfort Institute, is being offered direct to retail stores, according to J. H. Hayden, vice president in charge of sales. The mattress will be marketed in both twin and full-bed sizes, covered in damask tickings, and with matching coil spring foundations. The introduction of the new mattress is being supported by an intensive advertising

and merchandising program.

George W. Sniffin and Fred L. Arnold have announced the reorganization of the partnership of Sniffin, Arnold & Co., 76 Beaver St., New York 5, N. Y., to carry on the crude rubber brokerage business that existed for many years prior to World War II.

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J., recently honored 56 new 25-year employes as Manhattan Pioneers at the fourth annual dinner of that organization. The affair, attended by nearly 600 Pioneers and their wives (or husbands), also honored those Pioneers entering new five-year groups. The new members were introduced by Factory Manager Harry V. Snyder, who also presented the gold Pioneer Pins. John F. D. Rohrback, newly elected president of Raybestos-Manhattan was the principal speaker at the dinner, and Vice President Harry E. Smith paid tribute to the Pioneers in sales work. Members of the committee in charge of the dinner follow: chairman, James J. De Mario, Nathaniel Finch, Dennis J. Fenelon, who acted as toastmaster, Richard Griffith, and Emil W.

Koppers Co., Inc., Pittsburgh, Pa., announced May 1 that its divisional sales offices in the New York area are being consolidated in the Empire State Bldg., New York, N. Y., and that sales offices in the Chicago area are being consolidated in the Peoples Gas, Light & Coke Bldg., Chicago, Ill. Sales offices of the chemical, engineering and construction, piston ring, shops, tar products, and wood preserving divisions will be located in New York. These divisions formerly occupied space at three different New York locations and at Kearny and Westfield. N. J. Chicago will house district sales offices of the company's wood preserving, chemical, piston ring, shops, and tar products divisions. Offices of these divisions previously were in five different Chicago locations.

NEW ENGLAND



Paul R. Oliver

Farrel-Birmingham Co., Inc., Ansonia, Conn., has appointed Paul R. Oliver as West Coast manager, with headquarters at the company's office, 2039 Santa Fe Ave., Los Angeles, Calif. Mr. Oliver has worked as service engineer for Farrel-Birmingham since 1942 and before that had been employed from 1938 to 1942 by the American Can Co. and the Ankerite Paint Co. in electrical engineering capacities. Prior to that time he had worked 22 years for The B. F. Goodrich Co., first in his home state of Ohio at the firm's Akron plant, followed by 11 years at the Goodrich factory in Los Ángeles. He was in charge of electrical work during construction at this location in 1927 and remained as plant engineer until 1938. Mr. Oliver is a member of the Northern California Rub-ber Group and the Southern California Electrical Maintenance Engineers Associa-

Armstrong Tire & Rubber Co., West Haven, Conn., has added Ward Fisher to its staff. He was previously a tire com-pounder for The B. F. Goodrich Co. at its Akron, O., and Oaks, Pa., plants.

C. Lawrence Münch, president of Hood Rubber Co., Watertown, Mass., has been elected president of the Boston Chamber of Commerce.

Cabot Carbon Co., manufacturing subsidiary of Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass., has announced that its southwestern headquarters for the production of carbon black will be housed under one roof in Pampa, Tex., as soon as construction of a new six-story office building is completed. The company has reserved the two top floors in order to assemble in one place the administra-tive and field offices of the Texas and Oklahoma Panhandle areas. The company has also taken an auditorium on the roof which will be used for divisional meetings of production heads. Construction of the new building, which will be air-conditioned throughout, will begin as soon as plans now being drawn are completed.

General Electric Co., Pittsfield, Mass., has announced several changes among the personnel of its plastics division. Frank E. Golliher has been appointed production subeniner has been appointed production supervisor of the division; while Charles W. Bentley has been made assistant to the manager of the company's new plastics molding plant at Decatur, III. Mr. Golliher, with G-E for 17 years, came to the plastics division in 1937 as assistant auditor, and five years later became supervisor. tor, and five years later became supervisor of the fabricating department of the company's Meriden, Conn., works. Then in 1945 he was named to the staff of the manufacturing manager of the plastics division.

Mr. Bentley in 1940 entered the employ of Firestone Rubber & Latex Products Co., Fall River, Mass., and served as manager of its plastics division. Before coming to General Electric, Mr. Bentley was manager of the compression molding plant Pro-phy-lactic Brush Co., Florence,

David B. Folkerth, with the G-E plastics sales office since November, 1945, has been named chemical department district representative at the Pittsburgh, Pa., office. Mr. Folkerth, who joined the company in 1937 as a student engineer, was assigned to the plastics division in 1939, to the production section at Pittsfield in 1940, and to the fabricating production sec-

tion in Meriden in 1942. H. Arthur Howe has been made manufacturing manager of the company's compound division, which produces phenol, phenolic plastic materials, and magnesium oxide. Mr. Howe, superintendent of the division since February, 1947, has been with General Electric since 1933, when he started as a compound test man. Five years later he was put in charge of the compound plant, and at the end of 1945 he became operating engineer for the resin and varnish plant.

Edwin M. Shultes III has been named counsel for the chemical department to succeed A. Cohen, who will continue as patent counsel for the department, with headquarters in Schenectady, N. Y.

Jacobs Rubber Products, Inc., Danielson, Conn., has named William R. Muller vice president and sales manager of the company, which he joined in 1946. This assignment has been made for the purpose of expanding the company's production of natural and synthetic rubber products for general industrial and textile applications.

Summer Laboratory Clinics

(Continued from page 387)

Under the auspices of Polytechnic's Institute of Polymer Research, headed by Herman F. Mark, and the Division of Applied Physics, headed by Isidor Fankuchen, the series will include four sepwhether the series will include four separate clinics, as follows: June 7-11, "Weight and Shape of Macro Molecules in Solution"; June 21-25, "Polymerization Techniques"; June 28-July 9, "Industrial Applications of X-Ray Diffraction"; and July 12-17, "Advanced X-Ray Diffraction." The first clinic will be in charge of Dr. Mark; while Dr. Turner Alfrey, assistant professor of polymer chemistry at Polytechnic, will be in charge of the second clinic, and Dr. Fankuchen will be in charge of the third and fourth clinics.

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Packaging Exposition

"Proper Packaging Protects the Product and the Purchaser" was the theme of the American Management Association's seventeenth annual Packaging Exposition held at the Public Hall, Cleveland, April 26 to 30. The exposition attracted 13,800 packaging executives who viewed exhibits by nearly 200 manufacturers which occupied more than 10,000 square feet.

pied more than 10,000 square feet.

Transparent films, including Goodyear
Tire & Rubber Co.'s Pliofilm, Dow Chemical Co.'s saran, E. I. du Pont de Nemours
& Co.'s Polythene, Celanese Corp. of
America's Lumarith, and Bakelite Corp's
polyethylene, were displayed for use in
packaging of all types of fresh meats,
vegetables, and fruits. The trend toward prepacking was also accompanied by a trend toward packages which can be put to good use by the customer after the product has been removed. Among these was Mon-santo Chemical Co.'s "glamour package" for cheese, a rigid transparent box molded of clear plastic which can be utilized as a trinket box or sewing kit. Bakelite also exhibited refillable plastic bottles which are flexible and will spray powder or liquid when squeezed. Graphically illustrating a new container for perishable foods which permits them to be sent anywhere in the country by air without the use of ice was a shipment of lobsters received by Good-year from City Island, N. Y., through Airlines, Inc., packaged in a new thermo-kraft insulating material and a Pliofilm bag. Among the other exhibitors of packaging materials were Minnesota Mining & Mig. Co., Paisley Products, Inc., American Viscose Corp., Eastman Kodak Co., Arm-strong Cork Co., and Industrial Tape Corp. The Packaging Conference, held in con-

junction with the exposition, drew an attendance of approximately 2,000 manufacturers of packaging materials and machinery and packaged products. The conference included many papers and discussion groups on warehousing methods and techniques, packaging of perishable agricultural products, effective and economic methods of printing, package machinery maintenance, interior packing, and simplification of packaging specifications. It was reported that supplies of packaging materials are now coming into balance with demand and that he important raise that no important price increases are expected during the next few months.

Firestone Tire & Rubber Co., Akron, last month presented a 35-year service pin to Sales Manager L. G. Fairbank.

Appointment of Kenneth L. Edgar as sales manager for Velon film for Firestone Plastics Co. has been announced by Elmer French, general sales manager. Mr. Edgar has been Firestone's eastern division sales representative on Velon film, with offices in New York, N. Y. Born in Cleveland, O., Mr. Edgar attended the Case School of AF. Edgar attended the Case School of Applied Science and upon his graduation in 1940 joined Firestone Tire in one of its college training courses. He was first assigned to a technical laboratory in Akron, then to the fuel cells division of the Firestone Industrial Products Co. In 1945, Mr. Edgar was transferred to Firestone's plastics development laboratories at Paterson, N. J., and the following year assumed duties as Velon film sales representative in New York. In his new position he will maintain offices in Akron.



Howard M. Hubbard

Hubbard New HPM President

At the May 6 board meeting of The Hydraulic Press Mfg. Co., Mount Gilead, Howard M. Hubbard was made president, Howard M. Hubbard was made president, filling a vacancy created by the resignation of H. A. Toulmin, Jr., last November. Mr. Hubbard has been president of The Elliott Co., Jeannette, Pa., and Greenfield Tap & Die Corp., Greenfield, Mass. He served his shop apprenticeship with The Bullard Co., Bridgeport, Conn. Mr. Hubbard Level and the served his ser bard has also served as controller, secretary and treasurer, and company director of Harris-Seybold-Potter Co., Cleveland, and as managing director of the Seybold and Canadian divisions. For the past three years Mr. Hubbard has been a consulting and development engineer dealing with new products, manufacturing, and export of heavy power equipment.

Mr. Hubbard was born in South Hadley, Mass., 50 years ago. He received his B.M.E. degree from Northeastern University, Boston; he is also a graduate of the Harvard Graduate School of Business Administration with an M.B.A. degree. His military record includes service on the Mexican border and active foreign service in World War I with the 104th Infantry of the Yankee Division.

The new HPM head is a member of

many clubs and organizations, including The Duquesne Club (Pittsburgh), Harvard Club (New York), American Management Association, American Marketing Association, Tau Beta Pi Engineering Fraternity, Harvard Business Review Board, and Northeastern University Corp. (formerly a trustee).
Mr. Hubbard is married and is the fath-

er of a 12-year-old son.

The Biggs Boiler Works Co., Akron 5, has announced that its former president, B. R. Barder, who was associated with the company for 54 years, has disposed of his interests to capital represented by T. Hall Keyes, chairman of the board, and K. Mc-Kinley Smith, new company president, and T. E. Krizanek, executive vice president and general manager. The new owners, with a long and successful record in industrial finance, will pursue the company's policies of workmanship and service, with such expansion in mind as conditions may warrant. Mr. Krizanek contributes more

than 20 years of experience in manufacturing and industrial operations.

Changes at General Tire

General Tire & Rubber Co., Akron, through Vice President L. A. McQueen, recently announced that both of its major passenger-car tire lines, the lowpressure Squeegees and Silent Grips, are now available to the replacement market in all popular sizes. The new 11-rib Squeegee will also be available in sizes ranging from the larger 8.20-15 through all the popular sizes. These extra-low-pressure General tires conform with the automobile manufacturers' requirements of 24-pound air pressure for tires, but are said to have a factor of safety greater than the regular original equipment super cushion tires. Because of General's patented construction features, these tires have a safety factor of 11, the same as the number of Squeegee ribs on the four-ply tires. Neither the Squeegee nor the Silent Grip is available to automobile manu-facturers as original equipment.

Three personnel changes in the technical department at General Tire have been announced by A. W. Phillips, general manager of manufacturing. Lawrence Baker has become manager of product compound-ing for all General plants both in this country and abroad. William Hoelzer has replaced Mr. Baker as manager of domestic plant technical service, and Fred Theiss has been named manager of technical service in the company's Akron plant. Mr. Baker has had 14 years of experience in the rubber industry, serving as tech-nical division manager for Mansfield Tire & Rubber Co. before joining General last fall. Mr. Hoelzer returns to Akron after spending 19 years with Pennsylvania Rub-ber Co., a General subsidiary, where he was development manager. Formerly chief chemist before his new appointment, Mr. Theiss has been with General for 14 years. Robert Moran has been appointed mana-

ger of industrial tire sales at General. With the company 12 years, Mr. Moran has been associated with distribution and sales during this time. His most recent assignment was in truck tire sales. During the war years Mr. Moran was 'on loan' to the government. He served with the WPB Rubber Bureau in Washington for

more than a year.

General Tire has appointed W. Richard General Tire has appointed W. Richard Hucks chief chemist of its Waco, Tex., plant. Mr. Hucks was with The B. F. Goodrich Co. in Los Angeles, Calif., and Akron, O., before the war. During the war and until his new position he was associated with Rubber Reserve in Washington, D. C. He was deputy director of ORR in 1947

Colonial Rubber Co., Ravenna, has announced that its Stand-eze Softaire non-marking, non-skid rubber mat for the relief of fatigue from standing, described in our April issue, page 112, has been further improved for even greater comfort. The cellular structure of the mat has been enlarged, and the mat now contains more than 2.000 small, resilient cells. These added cells, it is said, give the mat greater resiliency and greater ability to handle heavier weights than before, while retaining the same free floating action. The mat is also available in red and white, green and white, and burgundy and white colors in addition to those previously furnished.

Harwick Standard Chemical Akron, has announced the breaking of ground for the construction of a new chemical processing and plastics manufacturing plant in Akron. According to com-pany president, C. J. Harwick, the new plant, to be built at an estimated cost of \$300,000, will be the first of several units planned for the five-acre tract which the company recently purchased in east Akron at Englewood Ave. and Sciberling St. The projected building will house a research center together with facilities for phenolic resin applications in its 50,000 square feet of floor area, and a consolidation of the company's warehousing facilities on its broadly diversified chemical lines is also planned for the new plant which is expected to be ready for operation about October 1 The company at present maintains partial manufacturing and warehousing operations in a building on Park St. The general offices of Harwick Standard will continue to be centered in their present downtown ocation in the Akron Savings & Loan

Welding Methods Corp., Dayton, appointed Otto Sords its Akron district representative. Mr. Sords, a registered professional engineer, was for many years connected with leading manufacturers of rubber working machinery and rubber products.

Welding Methods specializes in the production of heavy gears and other intricate shapes by flame cutting up to 12 feet in diameter, the reconditioning of Banburys and other rubber working machinery, and in the design and construction of special machinery including hydraulic presses and actuators, and electronically controlled feeding and ventilating systems for industry.

The Rubber City Stamp Club, Akron. has begun an active campaign to have Charles Goodyear, the discoverer of rubber vulcanization, included in the series of postage stamps portraying famous Americans. The 150th anniversary of Goodyear's birth will occur on December 29, 1950. According to Durain C. Butts, Akron rubber chemist and president of the club, this time would be particularly fitting to honor Goodyear with a commemorative stamp. The Akron group has won from the post office department a promise to consider the issuance of such a Goodyear stamp. Attempts are now being made to enlist the support of other stamp clubs throughout the country. Guest speaker at the club's May meeting was Ralph F. Wolf, Columbia Chemicals Division of Pittsburgh Plate Glass Co., who is author of the Goodyear biography, "India-Rubber Man." Mr. Wolf discussed the life of the inventor and displayed several interesting Goodyear relics.

New Bremen Rubber Co., Akron 9, has let contracts for the construction of a new building to occupy 40 by 120 feet. It is expected to be ready for operation by September 1, according to A. E. Sidnell, company vice president and factory manager. The addition to the existing plant was found necessary because of a very firm increase in demand for the company's dipped goods, and it will provide an increase in productive capacity of approximately 50%. The company manufactures a complete line of industrial and household gloves, baby pants, latex toys and dolls, and hospital supplies.

New Products from Goodrich

A new hydraulic hose for airplanes which withstands 3,000 pounds' working pressure is being manufactured by The B. F. Goodrich Co., Akron. Used on some of the newest large planes, the hose must handle the sudden surge of hydraulic power which operates landing gears, flaps, and other mechanical devices. Special steel wire with a tensile strength of more than 400,000 p.s.i. is used in construction of the hose which, under test, has shown the ability to withstand pressures far in excess of the 3,000 p.s.i. needed in operation, it is claimed.

Goodrich has announced a super-premium, "velvet pillow" auto tire, combin-ing extra tread width with extra low pressure, to go on sale immediately at the company's retail outlets throughout the country. According to James J. Newman, company vice president, the tire's white sidewall will be completely free from lettering or numbering, enhancing its appearance and making it easier to keep clean. The company name, serial number, and other lettering will be confined to a nar-row area outside the white wall. This premium-quality Silvertown tire has a fourply carcass and relatively light weight, but has six-ply strength, Mr. Newman said, owing to the use of extra-strength rayon cords throughout and double nylon shock shields." The latter feature, heretofore found only in the company's truck tires, helps account for the statement that the new tire has "almost double the bruise resistance of the regular 100-level tire.

In addition to being one of the sponsors of the extensive campaign being conducted by the rubber, automotive, and petroleum industrie, to impress motorists with the importance of correct tire inflation, Goodrich has also launched an interesting program of its own. It has sent master air gages to all of its territory managers, store supervisors, and retail service supervisors, with instructions to test all gages now being used to check customers' tires and to replace or repair all gages found defective. The campaign for proper tire inflation has taken on added importance recently with the trend toward the lowpressure tire. These tires will wear faster and, on the front tires, more irregularly than standard-pressure tires if the air pressure is allowed to drop below the designated level. Goodrich's new program is based on the fact that proper tire inflation must start with the use of an accurate air gage.

A. W. Carpenter, manager of Goodrich's physical testing laboratories in Akron, was married May 8 to Miss Irma L. Coon, Department of State secretary, in the First Congregational Church, Washington, D. C. Mr. Carpenter was presented with a coffee service by his office staff, together with many humorous reminders from friends and coworkers of his newly married state, including a ball and chain, a mouse trap labeled "So You Got Caught," rolling pin, can opener, and many others. Mrs. Carpenter is in Washington completing her work with the State Department. The couple will make their home in Akron after a wedding trip to New England during June.

Goodyear Personnel News

Goodyear Tire & Rubber Co., Akron, recently awarded service pins to the following veteran employes: 30 years, W. J.

Conway, field representative in the Philadelphia district; Emilie R. Dullard, secretary and cashier in Pittsburgh; K. B. Mc-Micken, farm manager of agricultural operations at Litchfield Park, Ariz.; C. C. Power, commercial salesman at Springfield, Mo.; 35 years, Wm. T. Bell, manager of distributers' sales, a charter member of the mechanical goods division, and head of the company's induction program for mechanical goods sales trainees; I. M. Quinn, special representative at New York, Y. Y.

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Darwin Chase has been appointed personnel manager of Goodyear's tire and mechanical goods plant at Hurlingham, Argentina, succeeding Frank Vernotzy, in the post since 1945. Mr. Vernotzy, formerly personnel manager at Goodyear's plant in Lincoln. Neb., will return to Akron for reassignment. Mr. Chase, who joined Goodyear in 1929, was in 1935, a production foreman when the company opened its Java factory. After his return to Akron he was made manager of supervisional training at Goodyear Aircraft Corp.; in 1944 personnel manager of the subsidiary aircraft plant at Newark. O.; and, more recently, personnel manager of Goodyear's Wingfoot Homes plant at Washington Park, Ill.

A. L. Adams has been appointed sales engineer for the aviation products division on the West Coast, with headquarters in Los Angeles, Calif. He leaves the managership of Goodyear Export aeronautical sales in England and Europe to take over his new duties. A native of Iowa and a graduate of Iowa State College with a B.S. degree in chemical engineering, Mr. Adams came to Goodyear in June, 1943, as a member of the factory office squadron. Later that year he was transferred to the government sales division for aviation sales. He became a member of the aviation products division at the time of its organization in July, 1945, and remained there until he was transferred to England with the export company in October, 1945.

The Paul W. and Florence B. Litchfield Awards of Merit for outstanding accomplishment during the past year in the company's sales organization were presented last month to: Philip K. Coe, manufacturers sales, Detroit, selected as "best domestic wholesale salesman"; Clarence A. Wheeler, Los Angeles, "best 'A' store manager"; and Walter R. Allen, Erie, Pa., "best 'C' store manager."

Recently reintroduced by Goodyear is the 26-1,25 red inner tube for bicycles manufactured prior to the war. This tube fits both the 26-1,25 American-made casing and the 26-1,25 English SS tire used on imported bicycles. The red tube is molded full size, requires less stretching to fit the casing, and is specially compounded for toughness and resistance to pinching and rim abrasion.

Bicycling for sport and transportation has reached a new high in popularity. Proof of this statement is furnished by production figures for 1947, estimated at approximately 2,800,000 bicycles, an all-time record, with 1948 production expected to go even higher. Keeping pace with the greatly accelerated bicycle production is the output of bicycle tires. The tire industry produced more than 9,000,000 units in 1946, and final figures for 1947, although not complete, will be substantially higher. While new bicycles take a large portion of this output, replacement demand is even greater since it is estimated that 14,000,000 bikes are currently being operated in the United States alone. As a

leading manufacturer of bicycle tires, Goodyear is making every effort to meet the enormous demand. The company has reintroduced its premium bicycle tire, the Double Eagle, has further improved its 26-1.375 tire designed primarily for lighte Philad. secre-В. Мсural op-Spring-l, manaweight bikes, and is now manufacturing all er memballoon sizes in both black and white sideion, and program s; I. M. w York.

Seiberling Rubber Co., Akron, has announced a new passenger tire to meet the competition of lower-priced tires recently announced by other manufacturers. The new tire, called Super Service, will retail at a price well under the list price for the company's premium passenger tires lines. According to sales manager L. M. Seiber-ling, the new tire will "give excellent service in its price field."

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Chicago Rawhide Mfg. Co., Chicago 22. Ill., in the April-May issue of the Rubber Press, published by the Sirvene division, commemorates the division's twelfth anniversary. The publication contains photographs of the company and divisional officers and stories and illustrations of the various departments and their personnel.

Link-Belt Co., 307 N. Michigan Ave., Chicago I, Ill., has announced the opening of a district sales office in Albany, N. Y., with headquarters at 309-310 First Trust Co. Bldg., 444 Broadway, Albany 7. J. Charles Pullock, district sales manager at Schenectady since the first of the year, has been appointed manager of the Albany office, and the Schenectady office has been discontinued. Mr. Bullock started with the company at its Dodge plant in Indianapolis, Ind., in 1935, work-ing successively in the order, pricing, estimating, application, and priority departments. He was district sales engineer at the company's Ewart plant in Indianapolis from 1942 to 1945, and district sales en-gineer at the Link-Belt Atlanta, Ga., plant from 1945 to 1948.

Monsanto Chemical Co., St. Louis, Mo., has announced the purchase of a surplus synthetic rubber plant from the War Assets Administration for \$169,500, contingent on approval by the United States Department of Justice. The plant States Department of Justice. The plant is adjacent to the company's plastics division plant in Springfield, Mass., and was built by Monsanto for the government during the war. The plant originally produced polydichlorostyrene, but after the war it was partially reconverted and produced materials for synthetic rubber for Rubber Reserve. When this work was completed, the plant was leased by Mon-santo and used for the manufacture of an oil additive. This manufacture of oil additives will be continued in the plant, Monsanto said.

Robert L. Sibley, general manager of the rubber service department at the Mon-santo plant at Nitro, W. Va., received an honorary degree of Doctor of Science on May 23 from Clark University, Worcester,

OBITUARY



@ Fabian Bachrach

Harvey J. Elwell

Harvey J. Elwell

THE man who has held the presidency of the General Latex & Chemical Corp., formerly the Vultex Corp. of America and the Vultex Chemical Co., Cambridge, Mass., since 1934, Harvey J. Elwell, is dead. The 54-year-old executive was also a director of the company.

was also a director of the company.

A graduate of the Sheffield Scientific School of Yale University and Lafayette College, he was born in West Haven, Conn. Prior to attending college he was graduated from the West Haven High

After completion of schooling in 1916 he was employed by the Winchester Arms Co, and the Winchester Simmons Co. of Boston. His career with the rubber industry began in 1928 when he became a branch manager for the Cambridge Rub-In 1930 he became general manager of the Vultex Corp. of America and manager of its chemical counterpart, com-bined into the General Latex & Chemical. He was made president four years later. When the companies merged into General Latex, the deceased continued the presi-dency. In 1943, General Latex, in asso-ciation with General Tire & Rubber Co., Akron, O., began operation, under government contract, of a synthetic rubber plant in Baystown, Tex., under managership of Mr. Elwell. under the general

Mr. Elwell was a member of the Yale Club of Boston, the American Chemical Society, the Brae Burn Country Club, Alpha Chi Rho, and Sigma XI.

He is survived by his widow, a son, a daughter a brother a sister and one

daughter, a brother, a sister, and one grandson.

Francis D. Gillen

WHILE on a business trip to Toledo, O., Francis Deering Gillen, manu-facturer's sales manager for The Gen-eral Tire & Rubber Co., Akron, O., died suddenly in his car on May 7. Mr. Gillen was born in Akron on May 31, 1895. He attended St. Vincent's High School

and was graduated from the University of Akron in 1918 in absentia. He also attended Akron Law School and night classes at the University of Akron. At the time of his graduation from the Universtime of his graduation from the University of Akron he was serving in France with the U. S. Army. Upon his return from overseas in 1919 he joined the Goodyear Tire & Rubber Co., as mechanical goods salesman and was in dealer relations. In 1923 he left to work for the Homeier-Whorley Co. From 1924 to 1928 he was commercial salesman for the Akron he was commercial salesman for the Akron district for General Tire and then he became Detroit territory salesman. In 1930 he was made sales executive of various divisions of truck tires and industrials in the Akron office.
A member of the board of alumni trus-

tees of the University of Akron from 1936-1939, the deceased was also a member of the Lone Star Fraternity, University Club, American Legion, Veterans of Foreign Wars, Knights of Columbus and was ac-

Wars, Ringhts of Control of the Holy Scout work.

Requirem Mass was said at St. Sebastian's Church on May 13, followed by inferment at Holy Cross Cemetery in Akron.

Surviving Mr. Gillen are his wife, two sons, and two daughters.

Richard Baybutt

R ICHARD BAYBUTT, proprietor of Ernest Jacoby Co., 79 Milk St., Boston 9, Mass., rubber brokerage and sales representative for chemical firms, died of cancer on May 22 at his home in Milton,

When still a young child, the deceased and his family left England, where he had been born on May 18, 1894, to come to the United States. He attended grammar and high schools in Boston and Cushing Academy, Soon after graduation he be-came associated with Ernest Jacoby, whom Mr. Baybutt succeeded as head of the

firm upon the death of the former in 1935.

During the late war Mr. Baybutt was called to Washington by Rubber Reserve Co. to take charge of the liquid latex department. He served as vice president of Rubber Reserve, deputy director of ORR (in charge of Distribution Department-Sales Division), and, from 1946, as president of Rubber Development Corp. He resigned the latter two positions in May, 1947, when he recurned to his business in

Mr. Baybutt belonged to the Masons, the Elks, and the Boston Yacht Club. Funeral services were held in Boston on May 24, followed by burial in Blue Hill Cemetery, Braintree, Mass.

Surviving are the widow, a daughter, and a son.

Canada

A. G. Spalding & Bros. of Canada, Ltd., Brantford, Ont., has made Sidney L. White vice president and general manager, according to President Charles F. Robbins. Mr. White succeeds the late Reginald V. Woffindin. Also reported were the appointments of Herbert O'Leary as manager in charge of sales advertising and promotion, and David W. Whyte as factory manager in charge of all manufacturing operations.

FINANCIAL

American Zinc, Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. First quarter, 1948: net profit, \$142,-267, equal to 8c a common share, against \$319,200, or 35c a share, in the 1947 quarter; net sales, \$9,999.692, against \$8,176,-

Anaconda Wire & Cable Co., New ork, N. Y. First three months, 1948: York, N. Y. First three months, 1948: net profit, \$1,833,469, equal to \$2.17 a common share, against \$2,483,213, or \$2.94 a share, in the corresponding period last

Columbian Carbon Co., New York. Columbian Carbon Co., New York. N. Y., and subsidiaries. Quarter ended March 31: net profit. \$1,986,644, equal to \$1,22 each on 1,612,218 capital shares, against \$1,622,083, or \$1.01 a share in the 1947 period; income taxes. \$698,000 against \$756,870; sales, \$10,599,258, against \$10,530,681

Johnson & Johnson, New Brunswick, N. J., and subsidiaries. Quarter ended March 31; net income, \$3,433,000, equal to \$1.82 each on 1,824,613 common shares contrasted with \$2,406,000, equal to \$1.28 each on 905,445 common shares, in the 1947 months; sales, \$42,926,293, against \$33.882.653.

Link-Belt Co., Chicago, Ill., and subsidiaries. Quarter ended March 31: net income, \$2,349,709, equal to \$2.91 a share, against \$1,489,460, or \$1.84 a share in the corresponding months a year ago; sales, \$25,872,660, against \$20,216,327.

Minnesota Mining & Mfg. Co., St. Paul, Minn., and subsidiaries. First quarter, 1948: net income, \$2,817,049, equal to \$1.39 each in 1.951.530 capital shares, against \$2.577.584, or \$1.32 a share, in the 1947 quarter; net sales, \$24,742,482, against \$21,526,429.

New Jersey Zinc Co., New York, N. Y. Quarter ended March 31: net profit, \$1,-824,908, equal to 93¢ a share, against \$2,-368,121, or \$1.21 a share, in the like period

Raybestos-Manhattan, Inc., Passaic. N. J. and domestic subsidiaries. March quarter, 1948: net profit, \$570,379, equal to 91¢ each on 628,100 capital shares, against \$1,401,363, or 99¢ a share, in the same months last year; provision for federal taxes, \$442,000, against \$780,500.

Sun Chemical Corp., New York, N. Y., and subsidiaries. First quarter, 1948: net profit, \$154.890, equal to 11c a common share, against \$351,815, or 29¢ a share, in the 1947 quarter.

Union Asbestos & Rubber Co., Chicago, Ill. March quarter: net profit, \$405,-964, equal to 82¢ each on 495,376 shares, against \$222.739, or 45¢ a share, in the same months of 1947; net sales, \$3,683,491, against \$2.117,107; provision for federal income taxes, \$248,817, against \$136,518.

O'Sullivan Rubber Corp., Winchester, Va. For 1947: net loss, \$168,321, com-

pared with net income of \$251,333 in 1946; net sales, \$4,384,940, against \$6,204,282.

The Timken Roller Bearing Co., Canton, O. March quarter: net profit, \$3,373,-720, equal to \$1.39 a share, against \$3,-456,969, or \$1.43 a share, last year.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. Quarter ended March 31: net profit, \$264,866, equal to 88¢ each on 298,898 capital shares, compared with \$306,798, equal to \$1.03 each on 298,818 shares, in 1947; net quarter; net sales, \$4,620,061, against \$4,938,592.

Graphs Reversed

The figures in the article entitled, "Pliolite Latex 190 in Latex Compounding," by J. A. Weatherford and F. J. Knapp, were placed incorrectly in the printing of our March issue. The captions for Figures 1 and 2 on page 743 are correct, but the graphs which should have accompanied these captions are those appearing above the captions for Figures 3 and 4 on page 744. In the same manner the captions for Figures 3 and 4 are correct, but the proper graphs appear over the captions for Figures 1 and 2 on page 743 instead of in their proper place on page 744.

United States Rubber Statistics, February, 1948

(All Figures in Long Tons, Dry Weight)

	New Supply		Distribution			
	Production	Imports	Total	Consumption		Stocks
Natural rubber, total Natural latex, total Natural rubber and latex, total	0	52,018 2,400 54,418	52,018 2,400 54,418	$\begin{array}{c} 49,104 \\ 1,908 \\ 51,012 \end{array}$	290 0 290	$^{140,797}_{00000000000000000000000000000000000$
Synthetic rubber, total	*37,690 † 1,335	1,318	40,343	35,375	428	65,649
GR-S	*29,940 †344	1,318	31,602	27,981	112	\$42,508
Butyl	*5,315	0	5,315	4,311	0	14,678
Neoprene	*2,435 †548 †443	0	2,983 443	2,570 513	271 45	5,516 2,947
thetic rubber, total. Reclaimed rubber, total GRAND TOTALS.	39,025 23,678	55,736 0 $55,736$	$\begin{array}{c} 94,761 \\ 23,678 \\ 118,439 \end{array}$	86,387 22,374 108,761	718 $1,273$ $1,991$	213,730 38,444 252,174

* Government plant production.
† Private plant production.
† Private plant production.
† Includes 31 long tons shipped for export, but not cleared.
† Includes 31 long tons shipped for export, but not cleared.
SOURCE: Rubber Division, OMD, United States Department of Commerce, Washington, D. C.

Dividends Declared

				STOCK OF
Company	STOCK	RATE	PAYABLE	RECORD
Armstrong Rubber Co	A & B	\$0.25 g.	July 1	June 17
				June 17
Armstrong Rubber, Ltd	Pfd.	0.59¾q.	July 1	
Belden Mfg. Co	Com.	0.30 q.	June 1	May 17
Boston Woven Hose & Rubber Co	Com.	0.50 q.	May 25	May 14
Boston Woven Hose & Rubber Co	Pfd.	3.00 s.	June 15	June 1
Brown Rubber Co	Com.	0.25 irr.	Tune 7	May 20
Brunswick-Balke-Collender Co	Pfd.	1.25 g.	Tuly 1	June 21
Brunswick-Balke-Collender Co	Com.	0.25	June 15	June 1
Canadian Tire Corp., Ltd	Com.	0.25 extra	June 1	May 20
Canadian Tire Corp., Ltd	Com.	0.30 q. incr.	Tune 1	May 20
			June 19	June 1
Dewey & Almy Chemical Co	Com.	0.35 q.		May 24
E. I. du Pont de Nemours & Co., Inc.	Com.	2.00	June 14	
E. I. du Pont de Nemours & Co., Inc	84.50 Pfd.	1.12½ q.	July 24	
E. I. du Pont de Nemours & Co., Inc.	\$3.50 Pfd.	0.87 ½ q.	July 24	July 9
Dunlop Rubber, Ltd	Com.	3% extra		
Dunlop Rubber, Ltd	Com.	12%		
Dunlop Tire & Rubber Corp	Pfd.	0.62 ½ s.	June 30	June 15
Dunlop Tire & Rubber Goods Co., Ltd	5% Cum. R			
Dumop The & Rubber Cooks Con Bear.	First Pfd.	21/2%	June 30	Tune 15
Electric Hose & Rubber Co	Com.	0.30 g.	May 21	May 14
			June 25	June 15
Faultless Rubber Co	Com.	1.00	June 10	May 27
Flintkote Co	Com.	0.50 q.		May 2
Flintkote Co	Pfd.	1.00 q.	June 15	June 1
General Electric Co	Com.	0.40	July 26	July 18
General Motors Corp	Com.	0.75	June 10	May 15
General Tire & Rubber Co	\$5 Com.	0.25 q.	May 28	May 11
Goodall Rubber Co	Com.	0.10 extra	June 15	June 8
B. F. Goodrich Co	Com.	1.00	June 30	June 16
B. F. Goodrich Co	85 Pfd.	1.25	June 30	June 16
Hewitt-Robins, Inc.		0.25 q.	June 15	May 27
Johnson & Johnson	Com.	0.10 incr.	June 12	May 26
	Com.	0.75	May 25	May 14
Lea Fabrics, Inc.			Tune 1	May 10
National Automotive Fibres, Inc.	Com.	0.15		May 28
Phelps Dodge Copper Products Corp	Com.	1.00	June 10	May 20
Raybestos-Manhattan, Inc	Com.	0.37 ½ q.	June 12	May 24
Rome Cable Corp	Com.	015q.	July 1	June 11
Rome Cable Corp	Pfd.	0.30q.	Jully 1	June 11
Seiberling Rubber Co	412 Pfd.	1.12 q.	July 1	June 15
Seiberling Rubber Co		1.25q.	July 1	June 15
Sheller Mfg. Corp		0.25	June 14	May 24
A. G. Spalding & Bros., Inc.	Com.	0.371/2 q.	June 15	June 8
Tyer Rubber Co		2.00	May 15	May 3
		1.0614 q.	May 15	May 3
Tyer Rubber Co		0.75 q.	Tune 10	May 14
United Elastic Corp			June 10	May 24
United States Rubber Co		1.00		May 24
United States Rubber Co	Pfd.	2.00	June 10	May 24

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3 COMPOUNDING ADVANTAGES







COLUMBIAN CARBON CO. BINNEY & SMITH CO.

MANUFACTURER

DISTRIBUTO

STATEX 93

combines in one carbon all the characteristics necessary to accomplish three vital compounding aims:

- 1. Low volume cost
- 2. Good physical properties
- 3. Smooth processing

Relatively high loadings of Statex 93 and suitable softeners produce outstanding results.

COLUMBIAN CARBON CO. BINNEY & SMITH CO.

MANUFACTURER

DISTRIBUTOR

Patents and Trade Marks

APPLICATION

United States

2,438,512. In a Pneumatic-Electrical Relay for the Conversion of a Rapid Pulse of Pneumatic Energy to a Corresponding Rapid Pulse of Electrical Energy, Including a Body Formed with a Chamber Open on One Side, a Flexible Diaphragm of Rubber-Like Material Secured to the Body so as to Close the Open Side, J. Mehut, Lyon, France, assigner to International Standard Electric

Corp., New York, N. Y.
2,438,572. In a Terminal Structure for Re-frigerating Apparatus, Including a Terminal Plate Having Apparatures into Which Project Terminal Studs Carrying Flanges. Synthesis. al Studs Carrying Flanges, Synthetic Gasket Material Vulcanized to Flanges and Plate. A. A. McCormack, Cleveland, as-signor to General Motors, Corp., Dayton, both

2.438.517. Medicine Dropper Including a Resilient Bulb for Drawing and Forcing Liquid in and out, and a Small Resilient Auxiliary Bulb Extension on the Bulb. A. Rothman. Bronx, N. Y. 2.438.606. In an Air Exhauster-Type Collection Apparatus, Including, in Combination, a Casing with Intake Opening, and an Air-Pressure Supply Chamber Mounted on the Casing, a Flexible, Inflatable Envelope Connected at Its Rear Edge with the Air-Pressure Chamber, and Maintained in an Inflated Condition Forming a Canopy over the Intake Opening. C. S. Hulton, assignor to Kirk & Blum Mfg. Co., both of Cincinnati, O. 2438.633. For Preventing the Accumula-

2,438,693. For Preventing the Accumula-tion of Ire on the Leading Edge of an Air-foll, an Apparatus Including a Covering of Rubber-Like Material and an Inflatable Tube. R. G. Campbell, Cuyahoga Falls, O., assignor

R. G. Campbell, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y. 2,438,757. Mounting Element for Machines or the Like, Including a Rubber Body, with Means at One End for Fixing It to a Support, and Means at the Opposite End to Fix It to a Machine; the Latter Means Include a Plate Bonded to the Body, Means for Rotaling the Plate to Generate Torsion Stresses in the Body, and Means for Fixing the Plate against Return Rolation. R. K. Lee, assignor to Kenlee Corp., both of Detroit, Mich. 2,438,771. Garment Protector. D. Toplian, Watertown, Mass.

Watertown, Mass. 2,438,804. Elastic Band for a Garment. H.

2.438,894. Elastic Baild for a Garment. H.
Hardle, assignor to Nobelt Co., both of Baltimore, Md.

2.438,826. For Open-Toe Shoes, a Protective Covering of Extremely Thin Waterproof
Elastic Material. S. Sabaneeff, New York,

8.428.901. Anatomical Sheath Formed of Oriental Polymeric Material, C. D. Coxe,

Bridgeport, Conn.
2438,395. High-Frequency
cable, Conductors and Core of which Are
Polystyrene. A. J. Warner,
sastignor to Federal Telephone & Radio Corp..

Newark, both in N. J.
2,438,965 In a Self-Sealing Fuel Tank, a
Sealing Member Including Layers of a SelfAdherent Composition of a Rubber Material
Swelling in Gasoline, and a Rubbery, Material
Insoluble in Gasoline, and Intervening Layers
of a Tough Resilient Non-Swelling RubberLike Material between the Self-Adherent Layers, and a Layer of Gas-Expanded Closed Cell
Sponge Rubber, All Adhered together. P. J.
Dasher, Stow, O., assignor to B. F. Goodrich
Co., New York, N. Y.

Co., New York, N. Y.

2,439,033. Tire with Vanes of Rubber-Like
Material Connected with the Sidewall at
Spaced-Apart Positions. J. O. Antonson.
Akron. O., assignor to B. F. Goodrich Co.,
New York, N. Y.

2,439,037. Ice-Removing Covering for Aireraft. R. G. Campbell, Cuyahoga Falls, O.,
assignor to B. F. Goodrich Co., New York,
N. Y.

2,439,051. Flexible Sheet Material Includ-2,439,051. Flexible Sheet Material Including a Surface Coating Containing Polyvinyl Chlorides. J. H. McGill, Manchester, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain, 2,439,137. Molded Article Including Layers of Resin Impregnated Fibrous Material; the Resin Content of the Layers Differ to Provide Layers of Varied Density and Heat Conductivity. A. V. Keller, Long Island City.

to Thompson's, Ltd., New York, both

2,439,196. A Float for Aircraft Including, in Combination, a Rigid Buoyant Cell and a Pneumatic Cell. R. A. Wolf, Eggertsville, and

L. M. Graham, Williamsville, assignors to Bell Aircraft Corp., Wheatfield, all in N. Y. 2,439,297. Casing Pattern Formed of a Thermoplastic Moldable Composition Includ-ing Wax and Polymerized Oll. R. C. Feagin, assignor to Austenal Laboratories, Inc., both of New York, N. Y.

Fluid Seal between a Bolted Pipe Fitting and a Fluid Storage Tank. J. C. De Weese, Essex, assignor to Glenn L. Martin Weese, Essex, assignor to Gl Co., Middle River, both in Md. 2,439,306. Rubber Gasket fo

Rubber Gasket for Bolted Tanks and the Like. C. D. Laidley.

Calif. 2,439,315. In a Seal Construction for a Shaft and Impeller Assembly, Including a Sealing Washer about the Shaft, a Deformable Rubber-Like Bushing Surrounding the Shaft between Sealing Washer and Impeller. J. A. Newton and N. Hoertz, assignors thompson Products, Inc., all of Cleveland, O. 2,439,339, Trouser Waist Grip Belt, A. D. Calenda, Maint Vernon, N. Y.

Grisanti, Mount Vernon, N. Y. 2,439,551. Plastic Fitting for Flexible Plas-tic Tubing, G. B. Thayer, Saginaw

2,439,351. Plastic Fitting for Flexible Plastic Tubing. G. B. Thayer, Saginaw, and R. D. Lowry, assignors to Dow Chemical Co., both of Midland, both in Mich.
2,439,365. For a Self-Sealing Container, a Liner Including a Layer of Partially Cured Rubber to One Side of Which Are Bonded Two Plies of Weftless or Broken-Weft Fabric, and to the Other Side a Third Ply, Weftless or Broken-Weft, of Fabric and a Ply of Polymerized Chlorobutadiene Coated Fabric, L. McLaughlin, assignor to Wingfoot Corp., 2,439,481. Pressure-Soudit.

both of Akron. O.
2.439.481. Pressure-Sensitive Adhesive Sheet
Material Including a Backing Having a Coating of Polybutene Adhesive on One Side and
a Film of a Water-Insoluble Metallic Salt or
Amide of Stearic or Palmitic Acid on the
Other Side, J. B. Martin, Glen Ellyn, Ill.,
assignor to Kendall Co., Boston, Mass.
2.439.562. Self-Sealing Fuel Tank Having

Other Side.

assignor to Kendall Co., Boston, Mass.

2.439.562. Self-Sealing Fuel Tank Having
Stiff Walls and Rounded Flexible Marginal
Edges Where the Walls Join One Another;
the Walls Are Formed of a Puncture Sealing Layer and an Outer Protective Layer of
Textile Material, with a Resilient ShatterResistant Panel of Woven Glass Cloth Impregnated with Synthetic Resin between the
First-Named Layers, M. M. Cunningham,
South Bend, Ind., assignor to United States pregnated by First-Named Layers.
Bend, Ind., assi

Rundber Co., New York, N. Y. 2,439,653. Finger Stall Including Circum-ferential Sections of Relatively Rigid Non-Elastic Material and Longitudinal Portions of Relatively Elastic Material. W. J. Forbes,

Battyri, A., Mo. 39,673. Valve Device Including a Flex-39,673. Valve Device Including a Flex-Elastic Diaphragm, a Portion of Which vudes from its General Plane to Consti-udes from its General Plane to Consti-Protrudes

Profrudes from its teneral trane to constitute a Valve Head. C. G. Roper, Fairfield, Conn., assignor to Manning Maxwell & Moore, Inc., New York, N. Y.
2,439,583. Sanitary Receptacle Including a Body Encircling Belt and a Flexible Waterproof Bag. E. N. Broderick, Detroit, Mich.
2,439,742. Distortable Circle Tire, J. V. Marcin, Pagamus N. J.

2,439,742. Distortal Martin, Paramus, N. 2,439,757. Perforate A. E. Sidnell, Akron Latex Products Co., I Perforated Rubber Laundry Bag. ton. hoth in

Latex Products Co., Barberton, both in O. 2,439,750. In a Self-Sealing Pipe Coupling of the Type Including a Non-Mobile Valve Fixed in a First Conduit, and Cooperating with a Mobile Valve Seating Between the First Conduit and the Valve, and a Mobile Valve Cooperating with a Non-Mobile Valve Seating in a Second Conduit; the Improvement Consisting of an Annulus of Rubber between the Mobile Valve Seating and the First Conduit, P. E. Thomas, Worcester Park, assignor to Sterling Industries, Ltd. London

both in England. 2,439,898. In a Method of Treating Eggs for Breaking, the Use of a Thin Coating of Thermoplastic Material on the Eggs. G. F. Hodson, Chicago, Ill., assignor to Wilson & Co. a corporation of Del.

Composite Artificial Filament.

2.439,813. Composite Artificial Filament.
M. P. Kulp, Linwood, Pa., and W. A. Sisson,
Silverside, assignors to 2 merican Viscose
Corp., Wilmington, both in Del.
2.439,814-815. Composite Thermoplastic
Filaments. W. A. Sission, Silverside, assignor
to American Viscose Corp., Wilmington, Del.
2.439,849. In an Assembly for Clutches
and Brakes, an Annular Diaphragm Structure
Including a Soft-Rubber-Like Portion for
Cushioning and Sustaining Torque. T. L.
Pawick, Akron, O., assignor to Fawick Airflex Co., Inc., a corporation of Ind.
2.439,906. In a Wheel Springing Element

Fawick, Airon, O., assignor to Fawick Air-flex Co., Inc., a corporation of Ind. 2.439,906. In a Wheel Springing Element Composed of Three Side by Side Metallic Disks, a Mass of Rubber-Like Material Sepa-rating the Inner Plate from the Two Outer Plates. E. H. Piron, assignor to Transit Re-search Corp., both of New York, N. Y.

2,439,971. In a Bearing for Use with Two Relatively Rotatable Members Having Dif-ferent-Size Internal and External Cylindrical Surfaces, a Longitudinally Slotted Cylindrical Cage Having Elongated Members of Rubber or the Like Fitting within the Slots and Adapted to Contact both Cylindrical Surfaces, W. B. Freeman, St. Louis Courty, Mo.

W. R. Freeman, St. Louis County, Mo. 2,440,103. Light-Polarizing Lamination Including a Sheet of Light-Polarizing Material and a Layer of Resilient Adhesive Material to Which is Affixed a Layer of Protective Glass Elements. E. H. Land, assignor to Polaroid Corp., both of Cambridge, Mass. 2,440,107. Safety Inner Tube for Pneumatic

Tres. N. R. Maddox, Owingsville, Ky. 2,440,198. Pressure-Detecting Covering Strip for a Surface in Airflow. W. C. Green, Akron, O., assignor to B. F. Goodrich Co., New York,

Accumulation of Ice on Airfields. J. O. onson, Akron, O., assignor to B. F. Good-

rich Co., New York, N. Y. 2,440,404. Shoe Heel with Exchangeable Heel Piece. G. E. Johansson, assignor to Robur Heel Co., A. B., both of Stockholm,

Rubber Elements in a Corrosion Resistant Fifter. V. A. Rayburn, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y. 2,410,533, Ice-Removing Apparatus for

Ice-Removing Apparatus
O Antonson, Akron, O., ass Airfoils. J. O Antonson, to B. F. Goodrich Co., Ne 2,440,569. Thin-wallard

to B. F. Goodrich Co., New York, N. Y. 2,440,569. Thin-walled, Flexible Proof Sack-Like Member as Plant Pot Cover F. G. Baldwin, Woodbridge, N. J. 2,440,670. Resilient Mounting, G. H. Kaemmerling, assignor to Lord Mfg. Co., both of Erie, Pa.

Dominion of Canada

447,354. Swimming Equipment for Attachment to the Feet, Including a Heel Strap, a Close Fitting Foot Pocket and an Extension Stretching away from the Foot, Made Partly of Elastic and Flexible Material and Partly of Less Extensible and Flexible Material. L. M.

Trouser Waist Grip.

santi, Mount Vernon, N. Y., U.S.A.
447.371. Hand Grip, for Golf Clubs and
Tools, Having a Roughened Surface of Grained
Synthetic Plastic. O. Sills, Ottawa, Ont.
447.416. Rubber Suspension Spring for Vehicles and the Like. R. W. Brown, assignor
to Firestone Tire & Rubber Co., both of to Fir

447,419. Teat Cup for Milking Machines Including a Tubular Outer Casing and an In-ner Flexible Liner. F. A. Gessler, assignor to Globe Milker, Inc., both of Des Moines, Iowa.

10wa, 447,432. Cable Joint Including a Paper-Insulated Cable Joined to a Rubber Insulated Cable, and a Tape Impregnated with a Mix-ture of Rubber and Polystyrene Wrapped around the Cables and the Paper and Rubture of Rubber and Polystyrene Wrapped around the Cables and the Paper and Rub-ber Insulation Adjacent the Connection. T. R. Scott, London, England, assignor to Inter-national Standard Electric Corp., New York, V. V.

447,443. Shoe Construction. G. R. Colclough, assignor to Miner Rubber Co., Ltd., both of Granby, P.Q. 447,552. Double Cog Belt. D. L. W., assignor to Dayton Rubber Mfg. Co., both of Dayton, O., U.S.A.

Dayton, O., U.S.A. 447.564. Composite Body for Use in Drawing Including a Supporting Sheet, a Layer of Alkyd and Melamine Resin Enamel, Containing a Luminescent Pigment Excitable by X-Rays, and an Opaque Coating, R. J. Wirshing and F. E. Smith, assignors to General Motors Corp., all of Detroit, Mich., U.S.A.

At 7.568. In a Method of Making Shaped, Laminated Articles, a Fluid-Retaining Pres-sure Bag Having a Wall with Surface of Conductive Rubber, and Means for Connecting This Surface to a Source of High-Frequency Electrical A. TeGrot to General

10 Falls, assignor to General Tire & Co., Akron, both in O., U.S.A. 17. For Enclosing Food Products, a cky Envelope of Wax-Modified Unvul-Rubber, E. E. Habid, Arlington, U.S.A., assignor to Dewey & Almy canized Rubber. E. E. Habid, Arlington. Mass., U.S.A., assignor to Dewey & Almy Chemical Co. of Canada, Ltd., Ville La Salle,

by Resilient Synthetic Material. E. A. Stuart, Wakefield, assignor to Haley Cate Co., Inc., Everett, both in Mass., U.S.A. 417,639-700 and 417,702. Buoyant Electric Cable. P. Dunsheath, Abinger, assignor to W. T. Henley's Telegraph Works Co., Ltd., Dorking, both in Surrey, England. 447,703. Tire Having a Tread with Circumferential Rib and Divided by Cross-Sitis into Displaceable Wedges. E. C. Woods, Gravesend, Kent, assignor to Henley's Tire

& Rubber Co., Ltd., Dorking, Surrey, both in

447.757. Mask to Deliver Oxygen at High Altitudes. A. H. Bulbulian, Rochester, Minn.,

U.S.A.
447.767. In the Manufacture of Molded.
Laminated Wood-Veneer Structures of Compound Curvature, the Use of Strips of Fabric
Coated with Waterproof Synthetic Resin
Bonding Substance as Bond between Layers
of Veneer. F. J. Masin, Winnipeg, Man.

of Veneer, F. J. Masin, Winnipeg, Man. 447,891. Composite Member Including Resinous Material Embodying Glass Fibers, J. G. Ford, and R. D. Spencer, Irwin, both in Pa., U.S.A., assignors to Canadian Westinghouse Co., Ltd., Hamilton, Ont. 447,891.

Hamilton. Ont. Resilient Wheel. B. W. D. Lacey R. Willcocks, Birmingham, Warwick, assignors to Dunlop Tire & Rubber R. England.

o. Ont Fabric from Mono-Filament 447, 824. Fabric from Mono-Filament Strands or Strips of a Vinylidene Chloride Copolymer. T. W. Stedman, New York, N. Y., assianor to Firestone Tire & Rubber Co., Akron, O., both in the U.S.A. 447,825. Wheel and Brake Assembly. R. W. Brown, assignor to Firestone Tire & Rub-ber Co. heater of Vincestone Constitution of the Con-linear Confession of the Constitution of the Con-traction of the Constitution of the Constitution of the Con-traction of the Constitution of the Constitution of the Con-traction of the Constitution of the Constitution of the Con-traction of the Constitution of the Constitution of the Con-traction of the Constitution of the Constit

ber Co., both of Akron, O., U.S.A. 447,809, Flexible Wall, Capable of Resist-ing Fire and Impervious to Gases, Especially for a Balloon Envelope, and Including a Layer of Fabric from Asbestos Threads, a Layer of Textile Fabric, and a Coating of Synthetic Rubber Applied to at Least One of the Layers, B. Lebray, Collingues, Physic, and M. Layer

& Cle., both of Paris, Seine, both in France, 447,395. In a Hydraulic Cylinder Assembly Including a Solenoid Controlled Valve As-sembly Including a Unitary Device Having a Pair of Spaced Washer-Like Elements, a Rubber-Like Sealing Means between These Elements. J. B. Parsons, Toledo, O., U.S.A. Elements.

United Kingdom

598,960. Pneumatic Cushions, Mattresses and Other Slab-Like Pneumatic Structures.

Resilient Joints or Mountings, G.

Resilient Mountings for Chair Seats, etc. Lord Mfg. Co. 599,348. Surgical and Medical Syringes and

Pumps. A. 599,457.

Imps. A. Piechaczek. 599,457. Rubber Mountings. Lord Mfg. Co. 599,533. Plevible Joints for Pipes. Soc. ntinentale & Coloniale de Construction, Soc. ≱ non. 599,618.

Anon.
599.618. Inflatable Chairs. K. G. Hann.
599.629. Elastic Suspension for Engines and
Like Bodies Subject to Vibrations. Soc. Anon.
Applications Industrielles Nouvelles.
599.682. Padding. etc. Sponge Rubber
Paralles of Computer Sponger Sponge

Products C 599,321. Moisture-Vapor-Proof Pouches. C. Olstad.

599,994. Electric Cables. Pyrotenax, Ltd., and J. G. Lewis.

PROCESS

United States

Reducing the Surface Adhesive-cles. R. H. Sperzel, assignor to 0 438 60 ness of Articles. R. Whitney Blake Co.. 2.438.685. Joining Joining Thermoplastic Pieces. I

2.438,854. Blowing Toy Balloons from a Plastic Composition of Polyvinyl Acetate in no Organic Solvent. J. G. Jakobsen, Copenhagen, Denmark, assignor to N. B. Bach, New York, N. Y. 2.438,852. Curing Proposition

TeGrotehuis, Oli eral Tire & Ru 2,439,043. En Falls, assignor to b. Akron, both in Belt, B. A. E Endless Belt. ., assignor to B. F. Go

Extremely Thin Impervious Rub-2.439,157. Ex ber Films. M.

M. A. Chavannes, Genthod, Swit-assignor to American Ecla Corp. zerland, assignor to American Ecla Corp., Dover, Del. 2,439,586. Belting Made from Fabric Knit-ted from Rubberized Yarn. G. A. Sowerby and W. S. Short, assignors to G. Angus & Co., Ltd., all of Newcastle-on-Tyne, England, 2,439,716. Forming Hollow Articles from

Co., Ltd., all of Newcastle-on-Tyne, England, 2.439,716, Forming Hollow Articles from Oriented Polymers. R. W. Canfield and F. E. Wiley, West Hartford, and A. M. Guerreiro, assignors to Plax Corp., both of Hartford,

both in Conn. 2.440,694. Lap-Welded Articles Made from Thermoplastic Films. C. R. Irons, assignor to Dow Chemical Co., both of Midland, Mich. 2.440,668. Cable Construction. J. P. Tarassignor to Budd Co., both of Phila

Dominion of Canada

447.392. Waterproof Laminated Fibrous sheet Material. J. C. Nicholson, assignor to British Artificial Resin Co., Ltd., both of Lon-Fibrous don. England

don. England.

447,553. Producing Envelopes, Suitable for Protecting Foodstuffs, from Unvulcanized Rubber. H. H. J. T. de Poix, Ruell, Seine-et-lose, France, assignor to Dewey & Almy Chemical Co., Cambridge, Mass., U.S.A., assignor to Almy Chemical Co. of Canada, Ltd., Ville LaSalle, P.Q.

447,568. Shaped Articles, T. A. TeGrote-huis, Olmsted Falls, assignor to General Tire & Rubber Co., Akron. O., both in U.S.A.

447,761. A Long, Flexible Float. H. A. MacDonald, Gravesend, Kent, assignor to W. T. Henley's Telegraph Works Co., Ltd., Dorking, Surrey, both in England.

ing. Surrey, both in England. 447,910. Elastic Yarn with an Inelastic Cover. A. Rosenstein, New York, N. Y., U.S.A.

United Kingdom

599,196. Drying Latex, etc. F A. Middle-

ton. 599,615. 599,615. Manufacture of Articles from Rubber or the Like. Dewey & Almy Chemical

599,701. Seamless Hollow Articles from Natural or Synthetic Rubber, Soc. Caoutchoue Someca.

CHEMICAL

United States

2,428,516. Solid Insulating Material In-cluding Nine Parts by Weight of a Styrene Polymer and One Part by Weight of 2:21-Ditolyl, A. A. New, London, England, assignor to International Standard Electric Corp., New York, N. Y.

North N. Y. 2,485,529. Resinous Polymer of an Organic Day Silicol Obtained by Reacting a Silicon Tetrahalide with an Unsaturated Aliphatic Monohydroxy Alcohol. N. P. Robie and F. E. Sheibley, both of Lewiston, assignors to Carborundum Co., Niagara Falls, both in

N. Y.
2.438.612. Copolymer of Tetraallysilane and
a Member of the Group of Methyl Methacrylate, Butyl Methacrylate, and Vinyl Acetate.
C. A. Mackenzie, Upper Moniciair, and J. B.
Rust, Montclair, both in N. J., assignors, by
direct and meson assignments, of one half
to Montclair Research Corp. and one-half to
Ellis-Korther Co. both corporations of N. J.

desearch 5. both corporations of ligher Alkoxy-Silicon assignor to Dow Cher and, Mich. Acrylonitrile Ellis-Foster (2,438.736. Higher

(13) Of Molland, Mich. 2,488,753. Butadiene-Aerylonitrile Copoly-er Plasticized with a Napthenic Acid Exter Petroleum Phenols. H. B. Kellog, Union y. N. J., assignor, by mesne assignments,

to Jasco, Inc., a corporation of La.
2,438,999. Subjecting Alkyl Hydroxyalkyl
Formal to Polymerization in the Presence of
an Ignorance Acid Catalyst and Neutralizing
the Catalyst to Stabilize the Polymer. W. F.
Gresham, assignor to E. L. du Pont de Nemones & Co. Lee, both of Wilmignore, bol mours & Co., Inc., both of Wilminston, Del. 2.438.949. Solid Rubber-Like Insulating Composition, Sufficiently Hard and Tough for Use as External Covering of Field Wire, Ina Mixture of Polyvinyl Chloride and

Polyalkylene Polysulfide. T. Scott and A. New. assignors to Standard Telephones Cables, Ltd., all of London, England. New, assignors to Standard Telephones & Cables Ltd., all of London, England. 2,438,953. Lens Cement Including a Poly-Alpha-Methacrylate and an Exter of a Polyhydric Alcohol and Hydrogenated Abietic Acid. H. C. Thuline, W. F. Parsons, and G. P. Waugh, assignors to Eastman Kodak C.

all of Rochester, N. Y.

2.438.998. Producing from Filaments of a
Vinyl Resin Stretched Yarns of Excellent Softness and High Loop-Break Strength. T. A.
Feild, Jr., E. W. Rugeley, and J. L. Petrokubi, all of Charleston, W. Va., assignors to
Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2.439.979. Copolymer of Nuclear Dichlorostyrene, Butadiene-1,3 and Piperylene. C. C.
Clark, Kenmore, assignor to Mathieson Alkali Works, Inc., New York, both in N. Y.

2.439.981. Polymer Prepared by Polymeriz-

kali Works, In 2,439,681. P

439,081. Polymer Prepared by Polymeriza Beta-Cyanoacrylic Acid Amide, Transm. J. B. Dickey and F. C. Duennebier, Form. J. B. Dickey and F. C. Dueni assignors to Eastman Kodak Co., all of

ester. N. Y.
2,439,202. Composition Including a Nor-mally Elastic Rubbery Copolymer of Buta-diene-1, 3 and Acrylonitrile and a Hard Normally Inelastic Resinous Copolymer of Styrene and Acrylonitrile. L. E. Daly, Misha-

waka, Ind., assignor to United States Rubber

waka, Ind., assignor. Co., New York, N. Y. 2,439,297. A Casting Pattern Formed of a Thermoplastic Moldable Composition Consist-ing of Wax and Polymerized Oil. R. C. Fea-gin, assignor to Austenal Laboratories, Inc.,

both of New York, N. Y.
2,439,213. Resinous Material Consisting of
the Interpolymer of 58% Para-Chloro-AlphaMethylstyrene and 42% Styrene, J. P. Kispersky, West Lafayette, Ind., and R. B. Seymour, Chattanooga, Tenn., assignors to Monsonto Chemical Co., a corporation of Del.
2,435,214. Copolymers of Alpha, BetaEthylenically Unsaturated Phosphonic Acid

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2,439,214. Ethylenically U Derivatives. R. V. Lindsey, Jr., assignor E. I. du Pont de Nemours & Co., Inc., b of Wilmington, Del.

Solid Resinous Material Consisting of the Interpolymer of a Mixture of Fi marodinitrile and Alpha-Substituted Styrene R. B. Seymour, Dayton, O., assignor to Mor santo Chemical Co., St. Louis, Mo.

Ternary Interpolymers rene, Maleic Anhydride, and Acrylonitrile, R. B. Seymour and J. P. Kispersky, Dayton, O., assignors to Monsanto Chemical Co., St.

Louis, Mo. 2,439,307. Recovery and Purification of Cyclopentadiene. H. R. Legatski, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del. 449,305. Simple control.

Dimerization Simultaneous Reduction of Acrylonitrile to Adiponitrile, R. M. Leekley, Chicago, Ill., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington. Del.

ton, Del. 2,439,343. Liquid Copolymer of Beta-Myr-cene and p-Methyl Styrene. E. L. Kropa, old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y. 2,433,369. Adhesive Including a Condensa-tion Derivative of Rubber and a Small Amount

Organic Diisocyanate. W. H. Nicol, oga Falls, assignor to Wingfoot Corp.,

Akron, both in O. 2,439,374. Material Opaque to X-Rays, Including Polymerized Methyl Methacrylate in Which Ethylene Dibromide Is Incorporated. S. A. Leader and J. J. Gordon, assignors to Portland Plastics, Ltd., all of London, Eng-

land.
2,439,395. Composition for Rendering Fabric Rot-and Fire-Resistant, Including Vinyl Acetate Vinyl Chloride Copolymer, n-Butyl Methaerylate Polymer, Tricresyl Phosphate, Zinc. Carbonate, Acetone, a Solvent, Mineral Spirits, Inert Pigment, and Pentachlorphenol.
M. Leatherman, Hyattsville, Md. Acetate Ving Methaerylate

M. Leatherman, Hyattsville, Md.
2,439,396, Fire-Resistant Composition for
Treating Yarn, Including Polyvinyl Chloride
or Vinyl Chloride-Vinyl Acetate Copolymer,
Acetone, Zinc Carbonate, Chromium Oxide,
Ferric Oxide, Lead Chromate, Mineral Spirits
and Zinc Naphthenate. M. Leatherman, Hy-Md

Delaware Co., Pa., assignor to ratives. P. Township Distant Vis

American Viscose Corp., Wilminston, Del. 2,439,514. In Manufacturing Reinforced Articles of Rubber, Such as Tires and the Like, Applying to an Active Hydrogen-Containing Fibrons Reinforcing Structure an Active Hydrogen-Containing Rubber and a Cyanate, Associating the Resulting Structure with Vulcanizable Rubber, and Vulcanizing. L. R. Herndon, Snyder, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

439,528. Polymerizing a Monoolefin Con-More than 4 Carbon Atoms in taining not More than 4 Carbon Atoms in the Presence of an Azine Catalyst. M. J. Roedel, Talleyville, Del., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington,

Making Butadiene by Reacting of Acetaldehyde with Ethyl Ace-ne Vapor State in the Presence of Mixture tate in the Vapor Steam and a Do Catalyst. E. E. S Co., Inc., both of Dehydrogenation-Dehydration

Co., Inc., both of Pittsburgh, Pa.
2,439,519, Organic Hydrocarbon Composition Stabilized against Deterioration and Oxidation by a Sulfurized Homopolymer of an
Alkyl Substituted 1,3-Pentadiene, R. C. Morris and J. L. Van Winkle, Bergeley, and A.
V. Snider, Richmond, assignors to Shell Development Co. San Francisco, all in Calif.
2,439,654, Metallic Coating on a Synthetic
Greenic Physic Surface.

Organic Plastic Surface. R. A. Gaiser and P. T. Mattimoe, assigners to Libbey-Owens-Ford Glass Co., all of Toledo, O. 2,439,669. Improving the Craze Resistance

a Methylpolysiloxane Resin by Prorine into a Solution of the Resin Effect of Ultra-Violet Radiation.

General Electric Co., a corporation of N. Y.
2,439,677. Coating Composition, Including
a Vinyl Halide Resin, a Solvent, and a Sufficient Quantity of a Hydroxy Polycarboxylle
Acid to Resist Blackening of the Coating
When It Is Baked on an Iron, Zinc, or Tin
Surface. C. L. Shapiro, Crafton, Pa., assignor,
by mesne assignments, to Lynnwood Laboratories, Inc., Newark, N. J.

Consist-C. Fea-es. Inc., sting of o-Alpha-

P. B. to Del. Kis-Beta-

Consistof Fu-tyrenes.

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d P. Ford sing nder

ling uffi-ylic ting Tin ora-

LD

2,439,810. Sulfuric Acid Reaction Products of 2-Mercapto-4,6,6-Trimethyl Thiazine, J. E. Jansen, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,439,824. Resin from Phenol, Formaldehyde, Saturated and Unsaturated Hydrocarbons and Rosin. F. Rostler and L. Bornstein, assignors to Wilmington Del.
2,439,828. The Dimer of 2-Mercapto-4,6,6-Trimethythiazine. P. Swedish, Jr., Rothschild, Wis, assignor to B. F. Goodrich, Co., New York, N. Y.
2,439,856. Liquid Cyclic Polymer of Dimethylidicare.

2,439,856. Liquid Cyclic Polymer of Dimethyl Silicone Having the Formula [(CH₃)₂SIO]_n Where $_n$ represents an Integer from 5 to 7 In-

Where "represents an Integer from 5 to 7 Inclusive. R. R. McGregor, Verona, and E. I. Warrick, Pittsburgh, Pa., assignors to Corning Glass Works, Corning, N. Y. 2,439,953. For a Laminated Member Composed of Sheets of Fibrous Material, a Binder Which Includes the Resinous Reaction Product of a Vinyl Aryl Compound and the Soluble Ester Reaction Product of Caster Oll and an Unsaturated Alpha-Beta Ethylenic Dicarboxylic Compound, and a Plasticizer. J. Swiss and N. C. Foster, McKeesport, assignors to Westinghouse Electric Corp., East Pittsburgh, both in Pa.

in Pa. 2,440,039. both in Pa.
2,340,039. Applying to a Preformed Dry
Sheet of a Cellulose Compound, Vinyl Resin
Dissolved in a Solvent also Capable of Dissolving the Cellulose Compound, and Drying
the Structure thus Obtained, thereby to Produce a Reticulate Pucker in the Sheet, N. J.
Reseaw, Resignation, Electric Compounds, and Compounds
Reseaw, Resignation, Electric Compounds
Reseaw, Reseaw,

Barrington, III.

1990. Interpolymer of an Alpha-Methylene Carboxylle Acid Fluoride from the Group of Acryly1 and Methacryly1 Fluorides with Methyl Methacrylate, B. W. Howk, Wilming-ton, Del., and R. A. Jacobson, Landenburg, Pa., assignors to E. I. du Pont de Nemours &

Pa., assignors to E. to a two Co., Inc., Wilmington, Del. 2.440,092. Cyclohexyl Alpha-Ethoxy Acry-late, M. Hyman, Jr., and P. H. Johnson, Jr., assignors to Polaroid Corp., all of Cambridge,

Mass.
2,440,095. 2-Mercapto Thiazones. J. E.
Jamsen, Akron. O., assignor to B. F. Goodrich
Co., New York, N. Y.
2,440,149. Monomeric Products Formed by
the Addition of Acrylonitrile and Drying Oil
Acids and Esters. H. A. Bruson, Rydal, and
W. D. Nederhauser assignors to Resinous
Products & Chemical Co., both of Philadelphila, both in Pa.

W. D. Niedernauser assignors of Products & Chemical Co., both of Philadelphia, both in Pa. 2,449,199. Non-Porous Polytetrafluoroethylene Articles. J. Mithan, New York, N. Y., assignor to E. L. du Pont de Nemours & Co., Inc., Wilmington, Del. 2,449,237. Resinous Polymers of Unsaturated Ethereal Esters. D. E. Adelson, Berkeley, and H. Dannenberg, Berkeley Highlands, assignors to Shell Development Co., San Francisco, all in Calif. 2,490,255. Polymerization of Methyl Methacrylate in Aqueous Acetone Containing a Plasticizer for the Polymer, in the Presence of a Perovide Polymerization of Methyl Methacrylate in Aqueous Acetone Containing a Distributed Polymerization of Acetone to Recover the Polymer in Priable Form. H. Dreyfus, London, England; C. Bonard, administrator of H. Dreyfus, deceased, assignor to Celanese Corp. of America, a corporation of Del.

to Celanese Corp. of America, a corporation of Del.
2.440,259. Milling into Natural Rubber, Butadiene-Styrene Copolymers or Butadiene-Styrene Copolymers or Butadiene-Arylonitrile Copolymers a Powdered Pigment Filler and Unsaturated Hydrocarbon Extender-Plasticize, in Such Proportion that the Total Plasticity Decreasing Effect of the Filler on a Butadiene-Styrene Copolymer with Scott Plasticity from 100 to 450 at Least Balances the Total Plasticity Increasing Effect of the Extender-Plasticizer. F. S. Rostler, Newark, and H. I. du Pont, Wilmington, both in Del. assignors to Wilmington Chemical Corp., New York, N. Y.
2.440,218. Catalytic Polymerization of Methyl Methacrylate. F. T. White and A. J.

York, N. Y.
2.440.318. Catalytic
Methyl Methacrylate, F. T. White and A. J.
Daly, both of Spondon, England, assignors by
mesne assignments, to Celanese Corp. of
America, a corporation of Del.
2.440.471. Selectively Producing Butadiene
and Pentadiene in Controlled Proportions
from Pentenes, W. R. F. Guyer, Roselle,
N. J., assignor to Standard Oil Development
Co., a corporation of Del.
2.440.492. Butadiene from a Mixture of
Butylene and Pentylene, W. D. Seyfried,
Wooster, and S. H. Hastings, Baytown, both
in Tex., assignors to Standard Oil Development Co., a corporation of Del.
2.440.493. Separating Butadiene and Acetylene from a Hydrocarbon Mixture.

ment Co., a corporation of Del. 2.446.493. Separating Butadlene and Acety-lene from a Hydrocarbon Mixture. G. H. Shipley, Jr., Baytown, Tex., assignor to Standard Oil Development Co., a corporation of Del.

of Del. 2,440,494. Low-Temperature Polymerization of Butadiene in the Presence of Methallyl Chloride. W. J. Sparks. Elizabeth, and R. M. Thomas, Union, both in N. J., assignors to Standard Oil Development Co., a corporation of Del. of Del. 2,440,498. Low-Temperature Polymerization

Catalyst. D. W. Young, Roselle, and H. B. Kellog, Union City, both in N. J., assignors to Standard Oil Development Co., a corpora-

to Standard Oil Development Co., 2,440,516. Reacting a Monoalkylol Amine, and Amino Acid Which Does not Lose Ammonia on Heating and a Dicarboxylle Acid which Does not Form an Anhydride on Heating and Which Does not Contain an Alpha, Beta-Unsaturation, to Produce a Resin Having an Acid Number and an Amine Number Each Less Than 5, E. L. Kropa, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y.

New York, N. Y.
2.440,554. Recovering Rubber from Cryptostegia Leaves by Fermenting with Clostridium Roseum. J. Naghski, Philadelphia, Pa., J. W. White, Jr., Washington, D. C., and S. R. Hoover, Philadelphia, Pa., assignors to the United States of America, as represented by the Secretary of Agriculture.
2.440,669. Aldehyde Condensation Products of Sulfonated Aromatic Compounds as Catlon Exchange Resins. J. T. Thurston, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y.

Dominion of Canada

447,400. Composition, Including a Vinyl Resin and an Ester Plasticizer for the Resin, Stabilized Against the Development of Odor by Incorporation of Phthalic Anhydride. I. M. Currie, Rocky River, O., U.S.A., executor of the estate of V. Yngve, deceased, in his life-time of Highland Park, N. Y., U.S.A., assignor to Carbide & Carbon Chemicals, Ltd., Toronto Ont.

Toronto, Ont. Grande & Carnon Chemicals, Edd., 447,407. Coating Wire for Making Belts by Passing a Wire through an Alkaline Pickling Bath, Drying the Wire and Passing It through a Solution of Synthetic Resh Adherent to Rubber, Exaporating the Solvent from the Coated Wire, and Covering the Wire with Rubber Composition. E. L. Lunces, assignor to Dayton Rubber Mig. Co., both of Dayton, O., U.S.A. 447,444. Adhesive Tape, Including a Paper Impregnated and Unified by a Relatively Non-Tacky Non-Hygroscopic Copolymer of Vinyl Acetate and a Neutral Ester of an Ethylene-Alpha, Beta-Dicarboxylic Acid. W. Ellgreen, assignors to

E. Lundquist and W. Kellgren, assignors to Minnesota Mining & Mfg. Co., all of St. Paul, Minn., U.S.A.

Minn., U.S.A.

447.481. Composition Including a Polyvinyl
Acetal Resin and a Tartrate of Hexamethylenetetramine as a Stabilizer. F. W. Cox,
Cuyahoga Falls, assignor to Wingfoot Corp,
both in O. U.S.A.

447,482. Preparing Vinyl Chloride by Passing a Mixture of Acetylene and Hydrogen
Chloride through a Layer of Metallic Mercury Catalyst Disposed on Surface-Active Carbon and Then through a Layer of SurfaceActive Carbon Free from Mercury. J. R.
Long, and C. E. Gleim, both of Stow, assignors
to Wingfoot Corp., Akron, both in O., U.S.A.
437,482. Preparing a Film Resistant to the

to Wingroot Corp., Akron, both in O., U.S.A., 447,482. Preparing a Film Resistant to the Transmission of Water Vapor and Including a Base of Cellulose Acetate and a Firmly Adhering Coating of a Copolymer of Vinylidene Chloride, LaV. E. Cheyney, assignor to Wingfoot Corp., both of Akron, O., U.S.A.

out Corp., both of Akron, O., U.S.A.
447,627. Condensation Product of a Dicaroxylic Aeid and Ethylene Bis(3-Aminaprooxt) Ether. A. M. Clifford and J. G. Lichty,
oth of Stow, assignors to Wingfoot Corp.,
dkron, both in O., U.S.A.
447,626. Polymers of the Propiolyl Halides.

(C. Solvators, Cambridge, 1997)

447,826. Polymers of the Propiolyl Halides, F. C. Schaefer, Cambridge, Mass, assignor to Winsfoot Corp., Akron, O., both in the U.S.A. 447,689. A Process Which Includes Dissolving a Mercaptothiazole in an Alkali Aqueous Solution, and Oxidizing with Nitrogen Chloride to Precipitate the Disallide of the Mercaptothiazole. M. G. Shepard, Waterbury, and W. E. Messer, Cheshire, both in Conn. U.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P.Q. 447,699. As Vulcanization Accelerator, a Reaction Product of an Arxivoscipations of the Product of an Arxivoscipations of the Product of an Arxivoscipation Solution.

conn., C.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P.Q.
447,596. As Vulcanization Accelerator, a Reaction Product of an Arylenethiazyl Sulfur Chloride with Ammonia, W. E. Messer, Cheshire, Conn. U.S.A., assignor to Dominion Rubber Co., Ltd., Montreal, P.Q.
447,741. Composition Including Cellulosic Ethers or Cellulosic Esters and a Plusticizer Containing a Carboxylic Acid Diester of Dihydroxy Methyl Butane. F. J. Soday, Batton Rouge, La., assignor to United Gas Improvement Co., Philadelphia, Pa., U.S.A.
447,779. Protective Coating Composition Including Polymerized Butyl Methacrylate Copolymers of Vinyl Chloride and Vinyl Acetate, and Normally Solld Chlorinated Diphenyl. J. W. Humphrey, assignor to American Viscose Corp., both of Wilmington, Del. U.S.A.
447,810. As Binder for Ess in the Mountain

C.S.A.
447.810. As Binder for Use in the Manufac-ture of Complex Shaped Laminated Members, a Relatively Thermoset Resin Composed of a Thermoplastic Resinous Polymer and the Reaction Product of a Phenol, an Arylamine and Formaldehyde, F. J. Nagel, Oakland, and B. C. Nash, Wilkinsburg, both in Pa.,

U.S.A., assignors to Canadian Westinghouse Co., Ltd., Hamilton, Ont.

447,834. Molding Powder Including a Major Amount of Disintegrated Redwood Pulp Still Retaining All Its Original Non-Volatile Ingredients, Furfuryl Alcohol-Formaldehyde Resin, and a Minor Amount of Boric Acid. E. Reineck, Appleton, Wis., and I. R. Dunlap, Bartlesville, Okla., assignors to Institute of Paper Chemistry, Appleton, Wis., both in the U.S.A.

447,926. Preparing 2-Chlorobutadiene-1,3 by Subjecting 2.2,3-Trichlorobutane to Vapor Phase Pyrolysis in the Presence of Copper Compound, O. W. Cass, Niagara Falls, N. Y., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q.

447,330. Synthesis of Vinyl Chloride. W.

U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,393. Synthesis of Vinyl Chloride, W. A. Lazier, Wilmington, and G. M. Whitman, Claymont, both in Del., U.S.A., assignors to Canadian Industries, Ltd., Montreal, P.Q. 447,393. Copolymer of Isobutylene with up to 15% of Methyl Ethenyloxyacetate. D. D. Coffman, Wilmington, Del., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,393. Methyl Methacrylate Polymer Laminated Butyral by Means of an Adhesive Including an Acid Polysilicic Acid Ester, M. L. Ernsberger and P. S. Pinkney, Wilmington, Del., U.S.A., assignors to Canadian Industries, Ltd., Montreal, P.Q. 447,393. 2-Fluoro-2, 3-Dichloro-Butane, F.W. Johnson, Wilmington, Del., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,393. MeLeish, Runcern, Cheshire, England, assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,398. Depolymerization of Polymeric Tetrathorocethylene, E. E. Lewis, Lyndhurst, N. J., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,398. Depolymerization of Polymeric Tetrathorocethylene, E. E. Lewis, Lyndhurst, N. J., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,398. Depolymerization of Polymeric Tetrathorocethylene, E. E. Lewis, Lyndhurst, N. J., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q. 447,398. Depolymerization of Hydrolyzed Ethylene/Vinyl Organic Ester Interpolymer Filaments, H. B. Stevenson, Wilm-

Ltd., Montreal, P.Q.
447,939, Improving Filaments of Hydro-lyzed Ethylene/Vinyl Organic Ester Inter-polymer Filaments. H. B. Stevenson, Wilm-ington, Del., U.S.A., assignor to Canadian In-dustries, Ltd., Montreal, P.Q.
447,940, Polymer of Aerylontrile Contain-

ington, Del., U.S.A., assignor to Canadian Industries. Ltd., Montreal, P.Q.

447,949. Polymer of Aerylonitrile Containing in the Polymer Molecule at Least 85% by Weight of Aerylonitrile Dissolved in a Solvent Including an Organic Sulfoxy Compound. R. C. Houtz. Snyder, N. Y. U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q.

447,941. Polymer of Aerylonitrile Containing in the Polymer Molecule at Least 85% Weight of Aerylonitrile and a Dimethyl Carbanyl Compound. G. H. Latham, Wilmington, Del., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q.

447,999. Flexible Sheet Composed of a Porois Fibrous Web and an Internal Bonding Agent Including a Copolymer of Butadiene and a Mono-Unsaturated Compound. L. W. Eger, Perth Amboy, and W. E. Engel, New Brunswick, both in N. J., U.S.A., assignors to Johnson & Johnson, Ltd., Montreal, P.Q.

448,912. Butadiene from Vapors of Crotyl Chloride, G. W. Hearne and G. A. Stenmark, both of Berkeley, assignors to Shell Development Co., San Francisco, both in Calif., U.S.A.

U.S.2.
418,013. Halogenated Mercaptans and Thlo-Ethers. W. E. Vaughan and F. F. Rust. both of Herkeley, assignors to Shell Development Co., San Francisco, both in Calif., U.S.A.

United Kingdom

598,961. Resinous Compositions. Monsanto Chemical Co. 598,962. Synthetic Resins. Shell Develop-

inous

ment Co.
195,982. Adhesives and Hardeners for Resinous Materials. Cellomold, Ltd., F. S.
Deutsch, and D. N. Davies.
195,995. Resins from Pentuerythrite and
Malele Anhydride. Soc. Anon. des Manufactures des Glaces & Produits Chimiques de
Saint-Gobain. Chauny & Cirey.

tures des G Saint-Gobain 599,006, C Saint-Gobain, Chauny & Cirey, 599,006, Concentrating Latex. De Cen-trale Verceniging tot Beheer van Proefstations v. d. Overjarige Cultures in Nederlandsch-Indie, and J. W. van Dalfsen. 599,054, Molding Compositions. Hercules Bowdor C.

599,005. Resinous Condensation Products.
Reck, Koller & Co. (England), Ltd., E. A.
Revan, and R. S. Robinson.
599,007. Electrical

599,097. Electrical Insulation. Imperial Chemical Industries, Ltd. A. S. Drummond, B. Jacob and B. J. Habgood. 599,098. Polymerical

599,098. Polymerization Process. Imperial Chemical Industries, Ltd., and R. G. R. Ba-

599.138. Moistureproof Polyvinyl Films. Firestone Tire & Rubber Co. 599,145. Synthetic Resins. Shell Develop-

ment Co.
599,173. Vulcanization of Synthetic Rubber.
Imperial Chemical Industries. Ltd.
599,202. Oli-Resisting Rubbers. British
Rubber Producers' Research Association and

Adhesive Waterproof Composi-599,203. tions. Pat 599,239.

ent & Licensing Corp.

Elastomeric Materials. Imperial industries, Ltd. Chemical Compositions of Vinyl Copolymers.

Carbon Chemicals Corp.

Separation and Purification of
Standard Oil Development Co. and Carbide Diolefins. C. Ar

Polymerization Process. J. C. andard Oil Development Co.).
Polymerization Reactions. Distil-Brighton. High Molecular Weight Polymeric J. C. Arnold (Standard Oil De-

Hydrocarbon Copolymers, J. C. andard Oil Development Co.).

Method of Polymerization. Im Arnold

perial Chemical Industries, Ltd., M. C. Ashworth, R. G. R. Bacon, and L. B. Morgan, 599,484. High Molecular Weight Hydrocarbon Polymers. Standard Oil Development

599,492. Impregnation Compositions. H. Methyl Polysiloxane Compositions. British Th

iston Co., Lto.
Including Vinyl
There de Nemours 599.523. Compositions Including Chloride Polymers. E. I. du Pont de Coating Compositions, E. P. New-

ton thereules Powder Co.).
599,555. Manufacture of Synthetic Resin
Articles by Polymerization. J. Doucerain.
599,580. Porous Articles Consisting Essentially of Polymers of Tetrafluoroethylene. E. I. du Pont de Nemurs & Co., Inc.
599,883. Manufacture and Utilizations of

Front de Nemours & Co., Inc. 1,683. Manufacture and Utilizations of Setting Polyhydric Phenolic Aldehyde sives, P. H. Rhodes Cold Adhesive P. H. Knodes. I. Polymerization. Firestone Tire &

Rubber Cast Polymerization. Pittsburgh

Copolymers of Aliphatic Hydro-C. Arnold (Standard Oil Developcarbons, J. C

Polymerizable Organic Materials and Polymers and Copolymers thereof, perial Chemical Industries, Ltd., and F. J.

Curing Polymeric Materials. Im-Chemical Industries, Harper.

d W. F. Smith.

Modified Rubber Compositions arper, and Wingfoot Corp.

MACHINERY

United States

2,433,498. Means for Heat Sealing Plastic Material. S. R. Geist, Sr., New York, and N. R. Davis, assignors to Gemloid Corp., both of Elmhurst, L. L., both in N. Y.

Tire Casing Vulcanizer. V. F. coor to Lewis Equipment & Supply 438.677 Ostler, assign Co., both of 2,438,856.

Plastics Injection Molding Machine. E. R. 2,438,857. Injection Unit for Plastics Mold-

ing. 1 E. R. K Extruder for Insulating Conductors, etc. D. D. Jones, Towson, Md. signor to Western Electric Co., Inc.,

Y.
1. Vulcanizer. L. 2,439,011. 2.439.011. Vulcanizer. L. J. and G. A. Larkin and J. J. Regan assignors to La Crosse Rubber Mills Co., all of La Cross. Wis. 2,439.064. Tool for Manipulating Rubber Sheet Material. F. S. Sternad. Cuyahoga Palls, C., assignor to B. F. Goodrich Co., New York, N. Y. 2,439.083. Tre Repair Device. E. E. French. assignor to O.K. Ko-Op Rubber Welding System, both of Denver, Colo. 2,439.135. Tire Removing Tool. T. M. Johnson. Burbank, and E. G. Reed, Los Angeles, both in Calif.

Johnson, Durantes, geles, both in Calif.
2,439,361. Machine to Apply Labels or Liners to Webs of Moistureproof Cellulose Film or Rubber Hydrochloride. R. J. Gaubert, assignor to Simplex Wrapping Machine both of Oakland.

Co., both of Oakland, Calif.
2.439.367. Apparatus for Transforming a Solid Thermoplastic Rubbery Composition of Rubber and/or Bitumen, Resins, and Inert Fillers to a Liquid Pourable State. W. F. Middlestadt, Baltimore, assignor to James Gibbons Co., Relay, both in Md.
2.439.779. In a Vulcanizing Machine of the Continuous Vulcanizing Drum, and an Endless Pressure Band Cooperating with in Arcuate Portion of the Drum, Apparatus to Control the Pressure

Band. G. D. Marcy, Newton Highlands, as-signor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass. 2,439.876. The Repair Device, N. Stevens,

Chicago, Ill. 2,439,896. Tire Repair Vulcanizer. H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron. O.

2.439.939. Apparatus for Rolling a Con-tinuous Sheet of Plastic Material with an Ex-truded Bead Superimposed thereon. I. L. savoy. ... 2.439,940 AH

2,439,940. Electrica.
E. Lewis, Baltimore, Md., assignor to wes.
Electric Co., Inc., New York, N. Y.
2,439,966. Injection Molding Apparatus.
W. Dinzl. Westfield, assignor to Watson S.
Co., Roselle, both in N. J.
Lang Wold. E. F. Gr

Tire Capping Mold. E. F. Green,

2,440,38). Tre Capping Mold. E. F. Green, Ashland, Ky. 2,440,321. Vulcanizing Mold. T. P. Bacon, Oakland, Calif.

2,440,598. Machine for Continuously Molding Rubber or the Like to Form a Sheath for a Wire or Cable. B. W. Benbow. Benbow.

2.449.662. Apparatus for Building Tires. L. C. Frazier, Lakewood, O., assignor to Nat-ional-Standard Co., Niles, Mich.

Dominion of Canada

447.420. Apparatus for Centrifugally Forming Sheet Thermoplastic. R. Mayne, assignor to Goodysar Fireraft Corp., both of Akron.

O., U.S.A. 447,456. Plastic Molding Machine. A. A. Burry, Toronto, Ont., assignor to Plastics Equipment. Ltd., Montreal, P.Q.

Equipment, Ltd., Montreal, P.Q. 447,508. Tire Retreading Equipment, P. E. Hawkinson, Minneapolis, Minn., U.S.A. 437,541. Means for Supplying, Heating,

Hawkinson, Minneapolis, Minn. U.S.A. 437.541. Means for Supplying, Heating, Mechanically Forcing, or Extruding and De-livering Plastics to Calenders, etc. J. Brown, assignor to David Bridge & Co., Ltd., both of Rochdale, I Lancaster, England.

Apparatus to Insulate Electrical

44,045. Apparatus to insulate Electrical Conductors. C. N. Stover, Towson, Md., as-signor to Western Electric Co., Inc., New York, N. Y., both in the U.S., 447,647. Apparatus for Insulating Conduc-tors. R. T. Jams, Chatham, N. J., as-

tors. R. T. Jdams, Chatham, N. J., assignor to Western Electric Co., Inc., New York, N. Y., both in the U.S.A.
447.698. Machine to Strain Stock for Use In the Rubber and Plastics Industry. F. T. Griffiths, Gravesend, Kent, assignor to W. T. Henley's Telegraph Works, Ltd., Dorking, Surgey, both in England. Surrey, both in England.

United Kingdom

599,390. Apparatus for the Manufacture of Sheets of Polymerized Material. J. Doucer-

59,528-530. Dielectric Heating Apparatus r the High-Frequency Heating of Dielectric aterial. Westinghouse Electric International Material.

599,579. Apparatus for Injection Molding Thermoplastic Materials. Thurgar, Bolle,

d. (A. Cretin). 599,666-667. Footwear Mold. Bata Akciova Spolecnost.
599.732. Tire Retreading Molds. H. W. K.

599.732. The neuronous Jennings (Super Mold Corp.). 599.869. Repair Vulcanizer, General Tire & Rubber Co. 599.894. Machines for Joining Sheet Ma-terials by the Heating Effect of Electric Stress Alternating at High Frequency. Brit-lab Insulated Callender's Cables, Ltd., J. C.

ish Insulated Callender's Cables, Ltd., J. C. Quayle and P. Jones, 599,898. Machines for Joining Sheet Materials by the Heating Effect of Electric Stress Alternating at High Frequency. British Insulated Callender's Cables, Ltd., B.-X. Plastics, Ltd., J. C. Quayle, P. Jones, and H. A. Nanagarow.

599,991. Apparatus to Manufacture Tubular Stock. United States Rubber Co.

UNCLASSIFIED

United States

2.438,656. Traction Device for a Vehicle Wheel Having a Rim and a Tire, S. M. Crumrine, Des Moines, Iowa, 2.438,759. Hose Coupling, J. W. Hughes, Dallas, Tex.

2,438,10%.
Dallas, Tex.
2,439,162. Eraser Holder. W. Edwards,
Calgary, Alta. Canada.
2,439,188. Tre Pressure Stabilizer. E. R.
Sage, Los Angeles, Calif.
2,439,501. Means for Assembling Rubber

Grommets to Gear Shift Selector Arms. H. J.

Ho

Long Beach, Calif. 661. Tire Pressure Indicator. P. A. 2,439,561. McG

Cressey, McGregor, Tex.
2,433,615. Pedestal Mounted Circumferentially Traveling Shoe-Type Tire Mounting Device. L. A. Smith, assignor to Shelby Cycle Co. both of Shelby, O.
2,439,642. Adjustable Hose Holder, M. C. White, New York, N. Y.
2,439,841. Coupling for Coaxial Cables, H.

2.4.3.8.41. Coupling for Couring (apres. H., R. F. Carsten, Liverpool, and C. H. M. Thorpe, Huyton, assignors, by mesne assignments to British Insulated Callender's Cables. Ltd., London, all in England.
2.440,144. Core Pin for Molding Valve Stems, O. W. Hosking, Monroe, N. Y., assignor to Composite Rubber Products Corp., Bedderson, Conp.

mor to Composite Rubber Products Corp., idgeport, Conn. 2,449,178. **Hose Coupling.** A. P. Lofquist,

Inglewoo

2.440,185. Machine for Stranding Wires. A. Prosser. Rochester, and E. A. Smith, ravesend, assignors to W. T. Henley's Telegraph Works Co., Ltd., London, all in Eng-

.440,398. Sargical Glove Drying Apparatus. L. D. Fenwick, Brooklyn, N. Y. 2.440,632. Traction Device for Resilient Tires and Wheels. G. O. Hack, Hudson, O.

Dominion of Canada

447,609. Emulsifying and Whipping Agent. F. Johnston, East Norwalk, Conn., assignor R. T. Vanderbilt Co., Inc., New York, N. Y.,

Apparatus for Indicating the Sta-Harding of a Body of Rotation. C. L. S. ilford and J. H. Hardman, Birmingham, Carwick, England, assignor to Dunlop Tire: Rubber Goods Co., Ltd., Toronto, Ont.

United Kingdom

Device to Spread Apart the Walls 199,037. Device to Special Penny.
Tire Covers, A. J. Penny.
199,050. Device to Connect a Cable, Tube,
Rod to Sheet Material. Dunlop Rubber
Ltd., G. W. Trobridge, and P. J. Bawor Rod to

599,102. 599,993. Hose Clamp. J. T. King. Flexible Hose Couplings. E. C.

TRADE MARKS

United States

437.543. Royal Archer. Elastic corset fabric. Archer Rubber Co., Milford, Mass. 437.545. Representation of an oval plerced by an arrow and containing the words: "Royal Archer," and above which are the words: "Archer Rubber Company," Elastic corset fabric. Archer Rubber Co., Milford, Marcher Rubber Co., Milford, Marcher Rubber Co., Milford,

437.579. **Selectron.** Polymerizable synthetic sins. Pittsburgh Plate Glass Co., Pitts-

437.0.cs. Pittsburgh Plate burgh, Pa. 437,639. Josette. Footwear. Valley Shoe Corp., St. Louis, Mo. 437,638. Resilon. Synthetic thermoplastic resinous plastic. United States Storeware Co.

Corp., St. Lives.

437.638. Resilon. Synthesis.
resinous plastic. United States Stoneware Co.,
Akron. O.,

437.679. Representations of a shield and a
label, the latter containing the words: "Cormons Creations." Footwear. Marx & Newman
Co., Inc., New York, N. Y.

437.637. Alluron. Shower curtains. I. B.
Kleinert Rubber Co., Inc., New York, N. Y.

437.691. B. A. Co., Raincoats. B. Altman
& Co., New York, N. Y.

437.707. Representation of a label containing the words "Penobsot Trampeze" and
representations of three pine ontaining representations of three pine rees. Footwear. Penobscot Shoe Co., Old Town, Me. 437.729. Arch Friend. Footwear. Julian

437.729. Arch Friend. Footwear. Julian & Kokenge Co., Columbus, O. 437,736. Representation of a triangle containing a light signal and the words: "Safety Legion." Raincoats. Winner, Inc., Berne, Ind. 427,742. Taurus. Soles and heels. Hungarian Rubber Goods Factory, Ltd., Budapest, Hungarian Rubber Goods Factory, Ltd., Budapest,

Hungary. 437,762. **Xpray.** Atomizers. Xpray Corp.,

New York, N. Y.
437,781. Styber. Synthetic resin thread
and yarns. Monsanto Chemical Co., St. Louis,

Mo. 437,825. Representation of a circle containing the words: "Goodall Rubber Co., Inc." and containing a smaller circle which in turn contains a representation of a four-leaf clover and the words: "G R Co Inc." Packing, belting, and hose. Goodall Rubber Co., Inc., Trenton, N. J. a circie Rubber

H. J. P. A.

nferen-ing De-Cycle M. C.

Valve Y., as-Corp.,

Smith, s Tele-i Engaratus.

esilient

Agent. ssignor N. Y., e Sta-

L. S. igham, p Tire Ont. Walls Tube,

Baw

E. C.

et fa-Mass. derced words: e the Clastic

Pitts-Shoe olastic e Co., and a
"Corwman

I. B. Y. Itman ntain-

Julian afety

Hunbread

ch in leaf Co.,

RLD

437,835. Paklite. Pneumatic mattresses. Hodgman 437,836. Plaffore. Pneumatic mattresses. Rubber Co., Framingham, Mass. 437,837. Rentailote. Pneumatic mattresses. Hodgman Assilboat and the word: "Airubber." Inflatable mattresses, cushions, and pillows. New York Rubber Corp., New York, N. Y. 437,851. Representation of a geometric figure containing the word: "Teenlanders." Footwear. American Shoe Co., Inc., St. Louis, Mo.

Mo.
437,877. Faultless. Hot water bottles,
syringes, droppers, etc. Faultless Rubber Co.,
Ashland, O.
437,885. Faultless. Sponge rubber and rubber sponge. Faultless Rubber Co., Ashland,

ber sponge. Faultiess Asseballs, rubber play blocks, novelties, etc. Faultless Rubber Co., Ashland, O. 437,879. Rutex, Stretches Like Rubber, Liquid and sheet synthetic rubber. Rutex, Inc., North Bergen, N. J. 437,929. Unichrome. Synthetic resinous material. United Chromium, Inc., New York, N. V.

material. United Chromeson.

N. Y.

437,937. Thermalon. Thermoplastic resin.
Mathieson Alkail Works, New York, N. Y.

437,954. Yarbo. Footballs. Victory Mfg.
Co., Philadelphia. Pa.

438,090. Representation of a circle containing the words; "M Products Serving Progress." Acrylic denture base. Motloid 438,000. Representation of a circle containing the words: "M Products Serving Progress." Acrylic denture base. Motloid Co. Inc. Chicago. III. 438,015. Vsheen. Vinyl resin coated piece goods. Goodall-Sanford, Inc., Sanford, Me. 438,017. Volafelt. Sheet rubber felted material. Vol Crepe, Ltd., Glossop, England.

438,042. Taurus. Tennis balls. Hungarian Rubber Goods Factory, Ltd., Budapest, Hun-

gary. 438,045. **Pliovic.** Synthetic polyvinyl chloride resins. Goodyear Tire & Rubber Co.,

ide resins.

Akron, O.

Akron, O.

438,947.

Streumliner. Elastic surgical goods. C. H. Gebauer, Chicago, Ill.

438,965. Lustrand. Synthetic resins. Monsanto Chemical Co., St. Louis. Mo.

438,963. Representation of a map on which are printed the words: "Tops In." Footballs, asketballs, etc. Shapiro Distributing Co., Newburgh. N. Y.

438,979. Polystron. Granule and powder thermoplastic materials. Omni Products Corp., New York. N. Y.

438,955. Coraliner. Polyvinylidine chloride paper coating. Docora Corp., Fort Edward. N. Y.

N. Y.
438,096. Trojan. Resilient buttons. Glazier's Tool Mfg. Corp., Chicago, III.
438,195. Silastic. Sheets, tubes, etc., physically comparable to rubber. Dow Corning Corp., Midland, Mich.
438,208. Antara 424. Dispersing and wet-

Corp., Midland, Mich.
438,208. Antara 424. Dispersing and wet-ting agents and solvent. General Aniline & Film Corp., New York, N. Y.
438,221. Glycox. Emulsifying and wetting agent. Glyco Products Co., Inc., Brooklyn, N. Y.

Y. 488,256. Silfluff. Filler and insulator. P. Hoyt. Inc., El Paso, Tex. 438,275. Celpron. Cellulosic plastic sheets, lms. etc. Celanese Corp. of America, New

438,275. Celpron. Cellulosic piastic sneeris, films, etc. Celanese Corp. of America, New York, N. Y.
438,288. Representation of a quadrangle containing a representation of an elephant and the words: "Quadrangle Jumbos." Footwear. Cannon Shoe Co., Baltimore, Md.
438,291. Rubapave. Floor composition. National Tile & Marble Corp., New York, N. Y.

N. Y.

438,396, Mogum. Tire and tube repair mold
gum. Mohawk Rubber Co., Akron, O.

438,396, Permalold. Molding powder and
plastic. Emsig Mfg. Co., New York, N. Y.

438,389. Bostonian Setter Red and representation of a dog's head. Footwear. Commonwealth Shoe & Leather Co., Whitman,
Mass.

monweath Snoe & Leather Co., Whitman, Mass. 438,382. Representation of an oblong con-taining the words: "Wales Goodyear." Foot-wear. United States Rubber Co., New York, N. Y.

wear. United States Rubber Co., New York, N. Y.

438.388. Representation of a square containing a representation of a baby looking into a mirror and above which are the words:

"Novotex Baby Panty." Baby pants. I. H.
Benedict, doing business as Novo Process Co., New York, N. Y.

438,399. Representation of a geometric figure containing the words: "House Beautiful."

Shower curtains. House Beautiful Curtains.

Inc., New York, N. Y.

438,395. Flex-O-Plastic. Rubberized liquid lacquer. Worth Lacquer & Chemical Co., Long Island City, N. Y., assignor to Worth Lacquer & Chemical Co., Long Island City, N. Y., assignor to Worth N. Y.

438,467. 2 fanciful label consisting of the words: "Lili Pride." Footwear, Air-Craft Shoe Co., Inc., Auburn. Me.

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

Exports of Domestic Merchandise

February, 1948 UNMANUFACTURED, Lbs. Value Quantity Crude rubber Chicle Balata 51,613 5,400 2,600 \$15,828 2,066 9,750 Balata
Jelutong, gutta percha,
and other gums.
Synthetic rubber: GR-S
Neoprene
Nitrile
"Thiokol"
Polyisobutylene
Other
Reclaimed rubser
Serap rubber 250,660 607,289 101,011 1,024 79,284 2,852,378 3,025,058 TOTALS 6.977.013 \$657.883 MANUFACTURED 46,421 \$57,759 3,478 5,061 59,105 70,731 25,821 38,180 123,949 55,848 34.841 214,954 53,895 14.781 49,120 38,078 241,528 2.667 60,050 51,479 68,294 7,230 14,493 117,107 9,222 4,437,540 1,180,084 457,655 Solid tires:
Auto and truck .no.
Other .lbs.
Tire repair materials:
Camelback .lbs.
Other .lbs.
Rubber and friction tape .lbs.
Raling .lbs. 78,762 221,564 23,306 107,292 47,779 65,711 102,077 1,823,614 151,120 710,276 164,128 758,288 31,441 30,234 54,220 502,327 123,235 188,139 55,220 74,544 508,693 \$12,256,290 \$12,914,173

Imports for Consumption of Crude and

Manufactured Rubber	February, 1948			
**		1		
UNMANUFACTURED, Llos. Crude rubber Rubber latex Guayule Balata Jelutong or Pontianak. Gutta percha Chicle Scrap rubber	Quantity 116,423,451 5,376,247 97,200 324,024 698,247 148,626 119,513 598,476	1,420,676 10,235 90,023 209,015 84,839 68,768		
		11,626 \$22,922,786		
	10,777,704	0,7,700		
MANUFACTURED Tires: auto, bus, and truck no. Bicycle no. Other no. Other no. Inner tubes no. Inner tubes no. Rubber footwear: boots prs. Shoes and overshoes prs. Rubber balls: golf no. Other athletic no. Other athletic no. Rubber toys, other than ballons Hard rubber products. Rubberized printing blankets lbs. Rubber belting lbs. Hose Substitutes, advanced lbs. Soft rubber products, other than drug	2,160 2,241 40 125	420 60 2,990 6,453 1,059 545 61 375 104 129 5		
sundries		14,220		
GRAND TOTALS, ALL RUBBER IMPORTS		\$612,190 \$23,534,976		
Reexports of Foreign I				
UNMANUFACTURED. LES.				
Crude rubber	650,5	19 \$170,339		
MANUFACTURED				
Drug sundries, other syringes and hot water Balloons. Rubber toys and balls Hard rubber electrical other than battery boxe Rubber and friction tape Balata belting. Hose and tubing:	goods, s lbs lbs. garden . lbs.	\$1,117 145 2,019 665 53 100 90 418 752 345 207 188		
Other rubber products .		342		
Council Funder products .		312		

Source: United States Department of Commerce, Washington, D. C.

Trade Lists Available

The Commercial Intelligence Division, United States Department of Commerce, Washington, D. C., recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms interested in the Division and from Department of Commerce field offices at \$1 a list for each country.

a list for each country.

Aircraft and Aeronautical Supply and Equipment Importers and Dealers—Argentina: Czechosłovakia: Turkey: Venezuela.

Automotive Equipment Importers and Dealers—British Malaya; Finland: France; Spain.

Automotive Product Manufacturers—Ecuador; Guatemala; Peru; Venezuela; Sweden; Switzerland

land.

Boot and Shoe Importers and Dealers—Chile;
Haiti; France; United Kingdom; Ecuador; Republic of the Philippines.
Boot and Shoe Manufacturers: Mexico; Panama; Portugal.
Chemical Importers and Dealers—Switzerland.
Corset, Brassiere, Garter, Suspender, and
Girdle Manufacturers—Argentina; Netherlands;
Brazil.
Mechanical Rubber Goods Importers and Dealers—India; Sweden.

Mechanical Rubber Goods Importers and Dealers—Costa Rica; Barbados; Republic of the Philippines.
Rubber Stamps and Stencils (Mimeograph)
Manufacturers—Brazil.
Sporting Goods Importers and Dealers—Anstria; Honduras.

438.469. Representation of a geometric figure containing the words: "SR Seamless Finest Quality Since 1877." Household gloves. Seamless Rubber Co., New Haven, Conn. 438.474. Sunny Original. Garters. Larry Polack, Inc., New York, N. Y. 438.494. Tru-Fif. Footwear. Selby Shoe Co., Portsmouth, O. 438.507. Picture of four men hanging from a bar around which is looped camelback being stripped from a suspended tire. Camelback. Gates Rubber Co., Denver, Colo. 428.541. Gates Powercord. Transmission belts, Gates Rubber Co., Denver, Colo. 428.541. Ray-Bond. Brake linings and clutch facings. Raybestos-Manhattan, Inc., Passaic, N. J.

OTS Bibliography Reports on Rubber Products—XII

THE abstracts printed below are taken from the United States Department of Commerce's weekly publication, "Bibliography of Scientific and Industrial Reports," Copies of the complete reports, either on microfilm or as photostats, as indicated, may be obtained from the Office of the Publication Board, Department of Commerce, Washington 25, D, C.

German Reclaimed Rubber Industry. L. A. White and others. (BIOS Final Rpt 482, Item 22.) PB-34043. May, 1946. 29 pages. Photostat \$2.2 microfilm \$1. Seven German reclaiming plants in the British Zone were visited in January, 1946, and results of the investigation are given in this report. The appendix includes drawings of mill room layous and machinery details.

Buna Rubber Research, M. A. Youker and N. A. Copeland, PB-16029, March 14, 1946, 50 pages, Photostal \$4; microfilm 50c, An investigation was made to determine (1) whether the Germans had discovered a better synthetic rubber than Buna S-3, and (2) in what direction they were working to obtain a better rubber. It was learned that Buna S-3 was still the best general-purpose synthetic rubber. It was believed, however, that a butadiene polymer would prove superior to the copolymers with styrene, and research was in that direction. They believed also that more work should be done on butadiene copolymers other than those with styrene, using low-temperature Redox systems. There is some discussion on Buna M. Buna K, and other copolymers. The appendix includes correspondence, field reports, and available Leverkusen research documents.

Interview with Dr. Stocklin and Dr. Reelig. Formerly of the Leverkusen Laboratories of I. G. Farbenindustrie A.G. D. Parkinson and H. E. Davis. (BIOS Final Rpt. 688, Item 22, 198-42747. August, 1946. 5 pages. Photostat \$1; microfilm \$1. This report states the views of Drs. Stocklin and Roelig concerning the merits of natural and synthetic rubbers as tire materials. Both men agreed that natural rubber was better than Buna S for tire cashings, but considered Buna better for tire treads because of its abrasion resistance. Mention is made of Buna S. and later Buna S-3, for curing tubes, and Vulkollan, an isocyanate synthetic rubber. The usage of channel blacks, acetylene blacks, and Teg. a form of aluminum hydroxide, was touched upon. The shortage of matural faity acids resulted in the use of synthetic faity acids in rubber. Aktiplast SH, a zine salt of mixed synthetic fatty acids, is a satisfactory substitute for stearic acid in rubber uses.

Polymerization of Chloroprene, W. Kern. (Suppl. to FLAT Final Rpt. 717. PB-16029.)
PB-46426. January. 1946. 21 pages. Photostat \$2.50; microfilm \$1. This paper, by Dr. W. Kern, chemist at the Hochst plant of I. G. Farben, deals with a discussion of the Redox polymerization of chloroprene; the influence of chloroprene peroxide upon the emulsion polymerization of chloroprene; quantitative determination of chloroprene encoxide; oxygen absorption by chloroprene monomer; the chemistry of chloroprene peroxide; influence of chloroprene peroxide upon chloroprene emulsions and polymers; and stabilization of solid chloroprene polymers. (Pages 1-7 in German, 8-19 in English.)

RAE, Plasticizer 111, Vulkollan H and T. Renacit. I. G. Farbenindustrie. PB-38880. January, 1943. 21 pages. Photostat \$2; microfilm \$1. This report gives test data on Buna materials containing the plasticizers RA. its derivative RAE, and 111 (dibutyl ester of dibetathiodibutyric acid). Various Buna S cements with and without addition of Vulkollan H and Vulkollan T are compared. Renacit II and III are regenerating and degradation agents.

Adhesive Properties of Buna. I. G. Farbenindustrie, Leverkusen. PB-38908. May, 1943, 31 pages. Photostat \$3; microfiin \$1. The adhesive properties of products obtained from Buna and Koresin are discussed.

Test Report on Italian Buna S. Eckert and others, PB-3809. April, 1943. 9 pages, Photostat \$1; microfilm \$1. No difference could be found between the products of the Perrara plant in Italy and the Schkopau plant in Germany.

The Production of Buna—Individual Articles on Synthetic Rubber 1942-1945. PB-4687. November, 1945. Microfilm \$6. This reel comprises original research reports delivered or discussed at various meetings of rubber experts and staff members during the years 1942-1945. It covers all phases of work on rubber.

Production of Buna—32 Types by Emulsion Polymerization. Wolz. PB-38878. May. 1944. 4 pages. Photostat 81; microfilm \$1. Buna-32; or Plastikator-32, is a soft butadiene polymerwith a K-value of 32. By emulsion polymerization the following three types were developed: (1) Buna-32-N, pure butadiene polymer (100% butadiene); (2) Buna-32-S, 75% butadiene, 25% styrene; and (3) Buna-32-SS, 55% butadiene, 45% styrene. Methods for the treatment of the latices are also indicated.

Acceleration of Polymerization. W. Kern. PB-38879. February, 1943. 17 pages. Photostat \$2: microfilm \$1. Bunas were produced by block polymerization of butadiene without sodium by means of soluble organic Redox systems. This emulsion polymerization can be accelerated or carried on at lower temperatures. New Redox systems have been discovered.

The Development of Buna 8-3 and 8-4. Weinbrenner, PB-38882, June, 1944, 9 pages. Photostat \$1; microfilm \$1. Shortage of materials necessitated the reduction of the content of linoleic acid, used as the emulsifying agent. Paraffin fatty acid and Nekal (sodium isobuty) naphthalene sulfonate) were used as substitutes and resulted in the development of the new Buna 8 types.

New Research Work to Improve the Capacity of Certain Textile Fibers to Adhere to Rubber. Bachle. PB-38883. June. 1944. 11 pages. Photostat 81; microfilm \$1. The fabric is impregnated in the cold with a diluted mixture of latex of about 8-15°c total dry content, of which 10 parts are rubber, and four parts are casein or haemoglobin. After drying, the fabric is kneaded and subsequently covered with a solution of a rubber mixture in heracity assoline. The use of other substances in place of protein is detailed. The use of Desmodur R is also covered.

A New Method of Mensuring Surface Stickiness. Schmitt. PB-38886. June. 1944. 10 pages. Photostat \$1; microfilm \$1. The stickiness of fresh mixtures can be determined by the elastometer by calendering these mixtures on to cloth and placing this coated cloth in the form of a disk over the elastic trap and as a band over the remodeled pendulum hammer. The elasticity of recoil and the number of strokes of the pendulum, compared with the values as obtained after coating with gasoline and other means, or by using the pendulum hammer without a test band, provide a measurement for the stickiness. It was intended to improve and further develop this method.

Influence of the Vinyl Components on the Mechanical Properties of Latex Vulcanizates. Logemann. PR-39507. February, 1941. Is pages. Photostat \$2; microfilm \$1. This is a report on the recent development of concentrated Perbunan latex. Particular attention is paid to the influence of varying amounts of the vinyl components on the material as well as to the results of the replacement of the acrylonitrile by other vinyl components. Tables and graphs are included.

Butadiene Copolymers for Carbon Black-Free Mixtures. Murke, PB-56568. February, 1912. 9 pages. Photostat 81; microfilm 81. This report presents a process for preparing strong and elastic carbon black-free vulcanizates from isolated Buna material. A high proportion of vinyl compound in the polymer is used, with a proper amount of regulator. A table giving composition and test data is included.

The Creaming of Synthetic Lattices. Schoench. PB-5-0518. February, 1941. 5 pages. Photostat \$1; microfilm \$1. The sodium salts of paraffinic fatty acids with a carbon chain of C3 to CS exert a creaming effect. The sodium salts of trichloroacetic acid and benzoic acid have the same influence. The latter especially has a favorable effect on the tensile strength values of the mixtures. Manufacture of Vulcanization Accelerators and Antioxidants by I. G. Farbenindustrie, Leverkusen. E. Mather and H. J. Lanning. (BIOS Final Rpt. 661, Item 22.) PB-47735. 20 pages. Photostat \$2: microfilm \$1. This report lists the various I. G. accelerators and antioxidants and the plants in which they are made. A majority is made at Leverkusen. and manufacturing details are given for Vulcacit M, DM, C. AZ. D, P. 774, Thiuram, J. P. extra, N, and CT, and antioxidants MB, 4010, DOD, and aldel-alpha-naphthylamine. Milling of accelerators is described. Equipment also is described. A short summary presents characteristics of those accelerators and antioxidants less known in the United States.

Buna High-Pressure Polymerization. Holzrichter. PB-50502. February, 1941. 5 pages, Photostat 31; microfilm \$1. Data and discussion show that when a higher content of ving compounds is employed. higher temperatures of polymerization can be used without impairing the properties of the products. The increase in pressure may be utilized under these conditions as a second factor for accelerating the reaction.

Acid and Alkali Polymerization of Buna SS, Dennstedt. PB-50503. February, 1941. 8 pages Photostat \$1; microfilm \$1. Comparative tests were made of the polymerization of Buna SS with acid and with alkaline emulsifying agents. As acid emulsifier. Esteramin hydrochloride (Esteramin is the esterification product of synthetic fatty acids with diethylaminoethanol) was used, and Nekal in alkaline medium was used as the alkaline emulsifier. As regulator, Diproxic (diisoproplyanthrogendisulfide) was employed. Results appear in two tables and three graphs.

Experiments for Producing a Light-Fast Buna 88, While Conserving Linoleic Acid and Phenyl-Beta-Naphthylamine. Graullch. PB-50506. March. 1941. 3 pages. Photostat & Namicrofilm \$1. The use of esteramine proved of help in producing a material equal to Buna containing phenyl-beta-naphthylamine in storability of the polymer and resistance to aging of the vulcanizates. While the capability for degradation is maintained, the material is rendered light-fast.

The Preparation of Chlorinated Rubber Substitution Products. Scheenol. PB-59525. May 1941. 6 pages. Photostat \$1. imcrofilm \$1. 1. 1-Dichloroethylene can be copolymerized with butadiene in all proportions. The copolymerization products were chlorinated until the chlorine content increased from 33 to 52%. These chlorinated products are readily soluble in various oils. The viscosity of the polymerization and chlorinated products can be changed by the quantity of regulator used, and any desired viscosity can be attained.

State of the Work on Buna Latex. Bachle, PB-43436. December, 1942. 3 pages. Photostat \$1; microfilm \$1. This report offers statistical data on the five lattices sold by 1. G. in 1940-42, and commercial problems are discussed. Many substances were tested as possible activators, and tetramethylene dithiocarbaminic acid pyrrolidine gave the best results. Emulgator MN can be used as emulsifier in a dilution of only 1-3% and improves the mechanical properties of the latex film more than other emulsifiers which require higher concentrations.

The Use of Igetex in the Preparation of Fibrous Leather. Sinn. PH-43437. December, 1942. 3 pages. Photostat \$1: microfilm \$1. The Isetex mixture for vulcanization should be left standing 16-24 hours after preparation before using. During this time sulfur and activator, and probably the zinc oxide as well, attach themselves to the rubber particles. As vulcanization must take place at a temperature below 60° in order not to damage the leather fiber, super-activators are necessary.

Heat Sensitization of Buna Latices with Igevin M-50. Sinn. PB-43138. December, 1942. 3 pages. Photostat 81; microfilm 81. This report describes a dipping, a casting and a spraying process for working up various rubber goods from Igetex NN mixtures (Buna latices) which were heat sensitized with a 50°c solution of Igevin M-50 in water, Mixing ratios for other Igetex types are also indicated.

New Plasticizers. Gompart. PB-43440. December, 1942. 8 pages. Photostat \$1; microfilm \$1. Based on the development of Plastikator 89 (digamma-dithiodibutyric acid dibutyl ester) as plasticizer for Perbunan, the following groups of chemical compounds were studied for similar effects: (1) dithiother carboxylic acid esters; (2) ether carboxylic acid esters; (2) ether carboxylic acid esters; and (3) sulfones of thiother dicarboxylic acids. Test results appear in five tables.

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MEDIUM ACRYLONITRILE GROUP

Here's Why:

- * EASY PROCESSING
- ★ GOOD TENSILE STRENGTH
- **★** GOOD ELONGATION
- ★ FLEXIBILITY AT LOW TEMPERATURE
- * HIGH FUEL AND OIL RESISTANCE

No polymer in the 26% acrylonitrile group can equal Butaprene NL for easy processing. It handles perfectly on mills, calenders and extruders. But that's not all - you get good tensile, elongation and flexibility—all very necessary properties in a fuel-and-oil resistant elastomer.

No matter what your compounding problem, you'll find a Butaprene polymer for the job. The Butaprene technical staff will be glad to work with you on any problem involving oil - and - fuel - resistant elastomers in either latex or solid form. Simply write Xylos Rubber Company, Distributors, Akron 1, Ohio.

* Reg. U. S. Pat. Off.





UTAPRENE* estone

AMERICA'S most VERSATILE

Copyright, 1948, The Firestone Tire & Rubber Co.

Textile Adhesion. Tischbein. PB-43432. December, 1842. 7 pages. Photostat \$1; microfilm \$1. This report covers work done for finding a method for improving the adhesion of textiles to Buna, as used in automobile tires. The problem was approached by (1) treatment of the cellulose or rayon itself with agents to improve adhesion, and (2) by the addition of the corresponding chemicals to the Buna mixture without pre-treatment of the textile. A large variety of chemicals was tested, and the most effective ones were the trihydroxybenzenes, which gave appreciable results.

The Addition of Desmosites H. O. T and R for Adhesion of Rubber to Metal. Von Spulak. Pls-43432. December, 1942. 13 pages. Photostat \$1; microfilm \$1. A survey is given of the fields of application where rubber to metal adhesion is concerned, and the most common procedures used. The various types of Desmosites are compared, and their suitability for such adhesion is tested. Desmosite R proved most efficient for the following reasons: (1) it gives good binding of Buna S. Buna SS. Perbunan, and natural rubber with metal; (2) the metal binding is little influenced by the usual constituents of the mixture; (3) the heat resistance of the binding is eveelent; and (4) the chemical is also effective in high dilutions.

Accelerators and Antioxidants. Pohle. PB-43442. January, 1943. 7 pages. Photostat \$1; microfilm \$1. Surveyed were new developments in the field of accelerators and antioxidants in Germany and abroad, chiefly in the United States. Various attempts were made to find substitutes for Vulkacit AZ (diethysulfenamide). Among them are aminobutadenes and Vulkacit P, a dithiocarbamate from piperidine. Among the antioxidants, "4616" is described as a mixed substituted paraphenylenediamine (cyclohexylphenyl) derivative. It can be combined with Vulkacit PP (formaldehyde-p-toluidine) or LS II (formaldehyde-p-toluidine) or LS II (formaldehyde-p-toluidine)

Processing with Carbon Dioxide. Greiff and others, PB-43403, May, 1942, 5 pages, Photostat \$1; microfilm \$1. This report deals with precipitation with bisulfite, compared with acetic acid. The Buna obtained with bisulfite was physically and mechanically as good as with acetic acid, but the former degraded more rapidly and had a lower softening point. Buna precipitated with carbon dioxide is slightly less satisfactory than that made with acetic acid, but can be welded more easily.

Starting Mixtures for Buna 8 without Linoleic Acid. Becker and Ecker. VB-43402. April, 1942. 10 pages. Photostat \$1; microfilm \$1.\$ In the alkaline mixture, linoleic acid has a double effect; it regulates the mixture, and it forms an iron salt soluble in rubber which facilitates thermal degradation. The first function can be better accomplished with suffur regulators, such as disopropyl xanthogenic disulfide (Diproxid). For the thermal degradation, the further addition of a degradation catalyst is necessary. Attached are two reports on tests of Buna 8 obtained without linoleic acid, and four graphs outlining its properties.

Buna 8 and 88 Acid Polymerized, Ecker and Greiff, PB-43400, May, 1942, 11 pages. Photostat \$1; microfilm \$1. Two laboratories evaluated the acid polymerized varieties of Buna, and both reports are unfavorable. Included are three tables giving a comparative evaluation of all the new polymers. Buna M is explained as mixed polymer of butadiene and methyl methacrylate; Buna MK, same components plus acrylonitrile; Buna MK, mixed polymer of butadiene and isopropenyl methyl ketone; and Buna A, mixed polymer of butadiene and disobutyl acrylamide.

Substitution of the Fatty Acids in Buna Polymerization Starting Materials by Synthetic Acids. Klein, PB-43418. December, 1942, 10 pages. Photostat \$1: microfilm \$1. This report deals with studies regarding the replacement of fatty acids by synthetic acids in the Buna polymerization process. Among the acids tested, perhydrobenzyl benzoic acid, perhydromethylhenzyl benzoic acid proved the most suitable as indicated by their effect on thermal plasticizing.

Possibilities with New Stabilizers. Weinbrenner, Pli-43421, December, 1342, 6 pages, Photostat £1: microfilm £1. Studies were made in Schkopau with regard to stabilization with alkylated naphthols, it was shown that types of rubber which are light-fast and heat-plasticizable may be produced with the aid of these stabilizers. Possibilities of improving thermal stability were noted. There was also evidence of a catalytic effect of the stabilizers on the degradation of Buna S.

Investigation of Igelit Latex. Meyer. PB-56785, August, 1941. 15 pages. Microfilm \$1; enlargement print \$1.50. The course of the Igelit polymerization was followed up with the aid of turbidity and surface tension tests, giving preferred attention to polymerizations using the Mesapon-Nekal mixture as an emulsifier.

Conferences and Reports on Synthetic Rubber, 1941-43, I. G. Farbenindustrie, CFLAT Microfilm Reel R-23.) PB-4672, November, 1945, 911 pages, Microfilm \$6. The material in this reel is the papers exchanged and presented at scientific rubber conferences of the Kautschuk Commission of I. G. Covered were polymerization methods and research, technical application and production research on synthetic rubbers, fabrication, the production and testing, and auxiliaries such as accelerators, antioxidants, etc. (In German.)

Precipitation with Carbon Dioxide, Klein and Weinbrenner, PB-43405, April, 1942, 2 pages, Photostat \$1; microfilm \$1. Buna S precipitated with carbon dioxide has a lower range of softening as compared with that precipitated with acetic acid. Comparative figures appear.

Concerning Copolymers of Acrylamides with Butadiene. Ecker and Wolfram. PB-43427. December, 1942. 15 pages, Photostat \$1; microfilm \$1.\$ This comprises two reports. The first is an evaluation of disobutyl acrylamide, which includes working properties, mechanical data, and data on the efficiency of the material when used in tire manufacture. The material is softer than and as elastic as Buna \$5. It is inferior to acid-polymerized Buna \$5 in clasticity, but is superior in adhesiveness. It can be fabricated more easily than Buna \$Mand is superior in fusibility and the efficiency of its tires. The second report treats of cold resistant Buna and shows its superiority to all known types of synthetic rubber.

Textiles and Textile Testing. Ivo Dane. PB-43431. December, 1942. 9 pages, Photostat \$1; microfilm \$1. The various test methods used to ascertain the suitability of textiles for tire manufacture are described and discussed. The mechanical principles of the testing machines are given, and the results evaluated. Results from these tests were found to correspond with service, Perlon was found superior in quality to cotton and rayon.

Plastic Materials—Technique in Use. Kollek. PB-L-58998. September, 1942. 5 pages. Photostat \$1; microfilm \$1. This is a brief report on developments in the use and application of plastic materials such as aqueous dispersions of plastics, Igelits, Oppanols, polystyrenes, Igamides, Lupolen, and combinations of Desmoquen and Desmodur.

Work on the Activation of Emulsion Polymerization, Rohm. PB-L-42813. February, 1943. 5 pages. Photostat \$11 microfilm \$1. Three new groups of catalysts for Buna emulsion polymerization are described. The first group comprises the pentacyano complex salts of iron, some of which are superior to all previously known activators. The second group consists of stilbene and similar compounds, some of which can be used in both acid and alkaline media. The third group consists of anides of organic acids substituted by halogen on the nitrogen. It was found that these substances can replace the peroxides (or persulfates) previously used and can surpass them in effect.

Polymerization Acceleration of Dienes, Kern. PB-L-42809. February, 1943. 15 pages. Photostat \$1; microfilm \$1. This is a comprehensive survey of the acceleration of polymerization by the use of Redox systems. Not all possible combinations of reducing and oxidizing materials had been tried, but results are detailed, and theoretical explanations attempted.

Stimulation of Emulsion Polymerization by Irradiation with Light of Short Wave Lengths, Schneider. PB-L-42810. February, 1943. 12 pages. Photostat \$1; microfilm \$1. It was found that water soluble anthraquinone derivatives stimulate the polymerization of styrene and other monovinyl compounds when irradiated with ultra-violet light, in the absence of oxygen. and in alkaline medium. Ordinary light filtered for exclusion of the longer wave lengths may also be used. Best results are obtained with those derivatives of anthraquinone and of phenanthrenequinone which do not contain aromatically bound primary amino or hydroxyl groups.

Reports of Meetings, File Notes and Correspondence Regarding Rubber Manufacture, I. G. Farbenindustrie A.G. Pills-L-74732, 1935-1944, 768 frames. Microfilm \$6; enlargement print \$7.7 (In German.)

The Mechanism of Polymerization of Buna M. Konrad Jost, PB-L-42812. February, 1943, 48 pages. Photostat \$4; microfilm \$1. This is a comprehensive report on technical experiences with Buna M polymerization. Diproxid (diisopropylxanthosenic disultide) should be added after 35-40% transformation in order to avoid premature cross-linkage and to obtain the correct proportion of high and low polymers. Masticability is improved by the use of softeners or solvents with high boiling points during polymerization. By the escribed combination of solven and emulsion polymerization, the essential advantages of each method are combined.

The Preparation of Mixed Polymers from Butadiene and Methyl Methacrylate. Teupel, PB-43423, Docember, 1942, 5 pages, Photostat \$1; microfilm \$1. Test results are given on Buna M, prepared by polymerization of butadiene and methyl methacrylate. Buna M can be prepared without changing the conventional apparatus. It differs from Buna S in that its physical properties are largely dependent on the polymerization temperature. It is superior to Buna S in strength, stretchability, mastication, low tendency to cyclization, workability, injectability, and damping behavior. It has excellent fusibility, but is inferior to Buna S in rebound elasticity.

Buna M—Evaluation of Technical Applications, Especially in Tire Manufacture. Oettner, PB-43426. December, 1942. 4 pages. Photostat \$1; microfilm \$1. Several modifications of Buna M were compared with Buna S in respect to suitability for tire manufacture. The advantages of Buna M over Buna S were found to lie in better workability and higher clasticity, although it is inferior in adhesiveness. Tire production was hampered by the poor fabricating qualities of Buna S which could not be overcome by any fabricating aids.

Polymers and Copolymers of Butadlene and Isoprene, Daniel, PB-L-42797. February, 1943, 19 pages, Photostat \$2; microfilm \$1. This report, a survey of the polymerization at Oppan, treats of processes for the preparation of butadlene, isoprene, vinyl methyl ketone, dimethylvinyl ethynyl carbinol, and methacrylonitrile. A detailed description is given of the preparation and properties of the polymers, and the copolymers are extensively discussed.

German General Rubber Goods Industry, Part II. S. A. Brazier and others. PB-L-63663. (PIOS Final Rept. 928. Item 22.) Marchapril, 1946. 277 pages. Photostat \$19: microfilm \$6. (For Part I, see PB-23585). This report covers visits to plants making the following products: packings, bathing caps, conveyer and other belting, rubber-to-metal bonded products, calendered goods, cellular rubber, ebonite goods, factice, rubber flooring, hose, hot water bottles, vinyl plastic sheet, protective clothing, rubber rings, soles and heels, surgical goods, rubber thread, solid tires, and reclaim. Technical information on laboratory and testing is given.

Chemistry of Polymerization as Applied to the Preparation of Buna Synthetic Rubbers, W. C. Davey and others, (SHOS Final Rpt. 800, Item 22.) PB-A-48192. August, 1946. 12 pages, Photostat 81; microflum \$1. This interview with Dr. Becker touches upon: future prospects for butadiene rubbers; conditions for polymerization; Redox catalysts; acid polymerized Buna; triple polymers; acidators of polymerization and their mechanism; chain terminators; oil resistant polymers; Koresin; and Pergut (chlorinated rubber).

Butadiene Purification by Means of Water Scrubbing, Chemische Werke, Huls. PB-L-65462, November, 1944, 11 pages, Photostat \$1: microfilm \$1. This document comprises (1) a brief report on crude butadiene purification with water scrubbers; (2) a report on the production of polyalcohols from butadiene oil and crude butadiene gas; and (3) a report describing the separation of butadiene from butylene. (In German.)

Production of Buna, I. G. Farbenindustrie A.G., Ludwigshafen, Germany, PB-A-55962, 1340-1342, 119 frames, Microfilm \$2; enlargement print \$12. (In German.)

Development of Synthetic Rubber Gas-Mask Compound with Improved Low-Temperature Flexibility, F. S. Gregory and others, PB-L-1863s, 131 pages, Microfilm \$3; photostat \$5. The object of the work was to develop a synthetic rubber compound for gas masks which would be suitable for use after long periods of storage at temperatures between -29 and +110° F. A Buryl rubber compound was developed which processed well in the factory, and which processed well in the factory, and which produced satisfactory gasmask face blanks, hose tubes, and nosecups. A bibliography, tables, and mixing charts are appended.

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EXTRUDING SPEED INCREASED 5% TO 7%

Sun Rubber-Processing Aid Decreases "Rugosity" and Increases Extruding Speed

A manufacturer of rubber hose, belts and other such products found that a Sun Rubber-Processing Aid speeded extrusion 5 to 7 percent, besides reducing "rugosity." So superior was it to competitive brands that he standardized on it for his plant.

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Influence of the Constitution of the Vinyl Components on the Quality of Butadiene Copolymers. Dennstedt, PB-L-42504, February, 1943. 10 pages. Photostat \$1;\$ microfilm \$1\$. The properties of the different Buna types are compared in extensive experiments. The results confirm the assumption that butadiene copolymers which form their polymeric hydrocarbon chains in such a way as to have quaternary carbon atoms are more workable than corresponding copolymers without such atoms.

Acceleration of Degradation by Azo Compounds, Runkel. PB-L-42799, February, 1943. 6 pages, Photostat \$1; microfilm \$1. Addition of small amounts of 4-hydroxyazobenzene (0.3% based on rubber) to Buna S latices accelerates degradation and in amounts above 1% also has a stabilizing effect. Other azo compounds tested were: azobenzene, 4-aminoazobenzene, 2.2-dihydroxy-5.5-dimethylazobenzene, 2.4-dihydroxy-azobenzene, 0-nitraniline azo-beta-naphthol, 3-chloro-4-methyl-aniline azo-beta-naphthol, and 4.4'-dihydroxy-azobenzene. azobenzene.

The Copolymerization of Butadiene with Acrylamides, W. Kern. PB-L-42788. February, 1943. 9 pages. Photostat \$1, microfilm \$1. The influence of various conditions on the copolymerization of butadiene with acrylamines was studied. A copolymer of butadiene and dissobutyl acrylamide for use in tire manufacture proved superior to most of the other copolymers of this type.

The Use of GR-S as a Substitute for Natural Rubber in Gas-Mask Hems. Frank Gregory, PB-L-78643. October, 1945. 158 pages, Microfilm \$4: photostat \$11. This report describes work on the development of GR-S compounds suitable for use in place of natural rubber in gas masks, A GR-S compound was developed which can be processed in the factory to give acceptable original physical properties, including low temperature flexibility. The aging properties of this compound, however, are not acceptable, and further development work is recommended.

Reports on Plastic Materials and Buna Testings, I. G. Farbenindustrie A.G. PB-L-74751. 1938-1846. 414 frames. Microfilm \$5; enlargement print \$41.50. (In German.)

Results of the Reppe Process, G. Niemann. PB-L-25601. 1946. 41 frames. Micro \$2; enlargement print \$6. (In German.)

(To be continued)

Aquablak Carbon Dispersions Announced by Binney & Smith

The trade name Aquablak has been adopted by Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y., for its improved series of aqueous carbon black dispersions. These dispersions are recommended for all applications involving a carbon black dispersions. These dispersions are recommended for all applications involving a water phase, including leather finishes, wallpaper, tire paints, casein paints, natural and synthetic latex compositions, coated papers, viscose rayons, vinyl and asphalt emulsions, drawing inks, shoe polishes, water colors, cements, and many other applications. applications.

applications.

Six dispersions are currently available, Aquablak B, the basic grade, consists of fine channel black for general use. Aquablak H contains a carbon of higher color value for use where the maximum jetness is required. Aquablaks M, R, and S are colloidal dispersions of furnace blacks and are characterized by blue-gray tones and high carbon content. Aquablak #1 provides a dispersion of bone black for use where the high color and the flat velvet finish of this pigment are required.

persion of bone black for use where the high color and the flat velvet finish of this pigment are required.

Aquablak H has a particle size of 18 millimicrons; 30% pigment by weight; specific gravity of 1.21; and weighs 10.07 lbs./gal. Aquablak B has a particle size of 28 millimicrons; 35% pigment by weight; specific gravity of 1.19; and weighs 9.88 lbs./gal. Aquablak S has a particle size of 42 millimicrons; 45% pigment by weight; specific gravity of 1.23; and weighs 10.20 lbs./gal. Aquablak R has a particle size of 50 millimicrons; 45% pigment by weight; specific gravity of 1.26; and weighs 10.50 lbs./gal. Aquablak M has a particle size of 84 millimicrons; 50% pigment by weight; specific gravity of 1.33; and weighs 11.11 lbs./gal. Aquablak #1 contains 50% pigment by weight; specific gravity of 1.33; and weighs 11.11 lbs./gal. Aquablak #2 contains 50% pigment by weight; 98.5% of its particles pass through a 325-mesh screen; its specific gravity is 1.45; and it weighs 12.06 lbs./gal. All six dispersions have a pH of 10-11.

Carbon Black Statistics, First Quarter, 1948

Following are statistics for the production, shipments, producers' stocks, and exports of carbon black for the first quarter of 1948. Production, shipments, and inventory figures are compiled from reports made available to the Bureau of Mines by the National Gas Products Association and by direct reports from producing companies whose operations are not covered by the Association. Export figures are reported by the Department of Commerce, but are not fully comparable in a given month because of the lapse of time between loading at producing plants and clearance for export.

(Thousands of Pounds)

Production: Contact types Furnace types	January 58,096 56,470	February 54,465 50,927	March 56,412 53,279	Quarter Total 168,973 160,676
Totals	114,566	105,392	109.691	329,649
Shipments: Contact types Furnace types	57,136 51,089	54,302 47,898	58,569 51,368	170,007 150,355
Totals	108,225	102,200	109,937	320,362
Producers' Stocks, End of Month:* Contact types Furnace type	7,916 70,829	8,079 73,858	5,922 75,769	5,922 75,769
Totals	78,745	81,937	81,691	81,691
Exports, total	20,117	31,264	28,984	80,365
Furnace types Totals Producers' Stocks, End of Month:* Contact types Furnace type Totals	51,089 108,225 7,916 70,829 78,745	47,898 102,200 8,079 73,858 81,937	51,368 109,937 5,922 75,769 81,691	150,35 320,36 5,92 75,76 81,69

* Subject to revision.
Source: Bureau of Mines, United States Department of the Interior.

United States Rubber Industry Employment, Wages, Hours

			Prod.				
	Prod. Workers 1000's	Prod. Workers Index	Workers Payroll Index	Avg. Weekly Earnings	Avg. Weekly Hours	Avg. Hourly Earnings	Consumer Price Index
All Rubber Products							
1939 1943 1947	121 194	100.0 160.3	100.0 263.9	\$27.84	36.9	\$0.754	99.4 133.5
1947 January February March April May June July August September October November December	240 240 238 234 223 219 212 215 220 223 225	198.8 198.2 196.5 193.5 184.5 180.7 175.2 177.8 178.1 182.0 184.5	386.3 385.0 374.3 383.9 367.2 361.9 352.7 357.4 369.0 375.6 383.3 396.5	54.03 54.06 52.97 55.23 55.30 55.74 55.92 57.76 57.62 57.99 59.48	40.6 40.6 39.8 39.5 39.0 39.1 38.6 38.7 39.9 40.1 39.9	1.330 1.331 1.330 1.397 1.416 1.419 1.445 1.445 1.445 1.438 1.454	153.3 153.2 156.3 156.2 157.1 158.4 160.3 163.8 163.8 164.9 167.0
Tires and Tubes							
1939 1943 1947	54.2 90.1	100.0 160.2	100.0 265.7	\$33.36	35.0	\$0.957	
1947 Ianuary February March April May Iune July August September October November December	127.7 126.6 125.5 123.1 119.3 117.7 115.1 116.1 112.5 114.4 115.1 114.8	235.5 233.3 231.4 227.0 220.0 217.0 212.3 214.9 207.5 211.0 212.2 211.7	416.3 413.3 397.3 414.2 399.3 396.1 389.5 396.0 397.9 398.0 407.5 412.1	59.78 59.90 58.05 61.64 61.12 61.35 62.06 62.15 64.75 63.78 64.86 65.74	39.5 39.3 38.2 38.2 37.6 37.7 37.9 37.8 38.9 38.7 38.9 39.5	1,511 1,517 1,512 1,608 1,622 1,615 1,640 1,640 1,661 1,647 1,661 1,658	
Boots and Shoes							
1939 1943	14.8 23.8	100.0 160.5	$\frac{100.0}{268.8}$	\$22.80	37.5	\$0.607	
January January February March April May June July August September October November December	23.2 23.8 23.8 23.5 22.8 21.4 20.1 18.9 21.0 21.7 22.0 22.5	156.5 160.2 160.1 158.4 153.6 143.9 134.1 127.2 141.6 146.1 147.9 151.4	322.5 328.5 321.7 333.3 331.2 317.1 290.0 268.4 314.4 331.7 322.4 367.1	46.06 45.83 44.91 47.03 48.27 49.62 48.46 47.23 49.26 51.28 49.26 54.96	41.9 42.0 41.2 40.8 40.7 41.4 40.5 39.9 41.8 42.4 40.6 44.6	1,099 1,098 1,090 1,152 1,185 1,198 1,187 1,183 1,194 1,211 1,213 1,230	
Other Rubber Goods							
1939 1943	51.9 79.9	100.0 154.1	100.0 255.8	\$23.34	38.9	\$0,605	
January February March April May June July August September October November December	89.6 89.5 88.3 87.3 81.0 79.5 76.8 79.6 81.9 84.0 86.1 87.7	172.8 172.6 170.2 168.4 156.3 153.2 148.0 153.5 162.0 166.0 169.1	354.5 354.4 348.7 348.4 325.5 320.1 304.9 321.5 338.3 352.3 362.2 379.9	48.12 48.27 48.23 48.53 48.81 48.95 48.22 49.17 50.40 51.03 51.27 52.93	42.0 42.1 41.8 41.0 40.6 40.5 39.1 39.7 40.9 41.4 41.8	1.146 1.147 1.154 1.184 1.201 1.232 1.237 1.234 1.232 1.252	

Source: BLS, United States Department of Labor, Washington, D. C.

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First Quarter Total 168,973 160,676 329,649 170,007 150,355

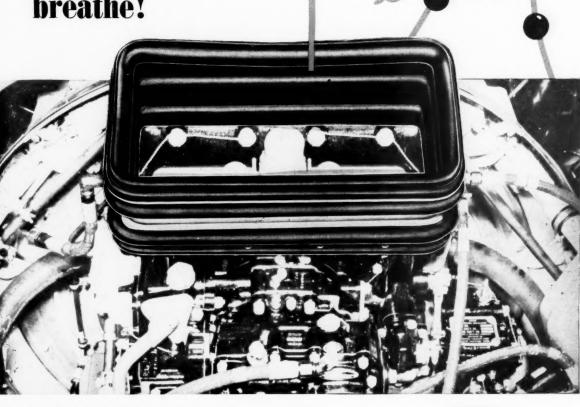
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PERBUNAN

helps 4,800 horses breathe!



THE FLEXIBLE COUPLING shown above is a mighty important item on the 4800 horsepower Pratt & Whitney engines used in the new Convair-Liner commercial transports.

It connects the air duct to the carburetor...carries in the tremendous feed of air needed for proper gasoline mixture. It has to have hot-temperature dependability...high resistance to oil and high octane gasoline...and lend itself to precise fabrication.

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DE MOLD RELEASE EMULSION NO. 35

pays another dividend!

You who have been using our DC Mold Release Emulsion No. 35 know the large dividends it pays in mold maintenance, reduced scrap and improved appearance. Now a new dividend in the form of a 5% price reduction has been declared by Dow Corning, Increasing demand for our Silicone Release Agent has enabled us to produce larger quantities at a lower cost. Our savings are passed on to you. During the past two years while other material costs have gone up, the price of DC Mold Release Emulsion has been reduced by a total of 18%.

Typical of the many profitable applications found for DC Mold Release Emulsion No. 35 are:

In molding tires—B. F.
Goodrich and other leading fire manufacturers use
DC Mold Release Emulsion
No. 35 as a mold and
curing bag lubricant.

In molding mechanical
rubber goods—Emulsion
No. 35, applied to press
plates gives clean, easy
release and freedom from
surface defects in the
rubber sole stock molded
by Baldwin Rubber Co. of
Ponlice. Michie an.

Photo courtesy Baldwin Rubber Co.



DC Mold Release Emulsion No. 35 keeps this 81 cavity precision pin mold clean 16 firmes as long, therefore reducing mold maintenance at Anchor Rubber Products, Inc., of Cleveland, Ohio.

Photo courtesy Anchor Rubber Products, Inc.

DC Mold Release Emulsion gives clean and easy release of rubber goods from even the most complicated molds. Seminorganic in nature, it neither carbonizes nor forms a build-up on the mold. It, therefore, reduces mold maintenance to a minimum. Surface blemishes, non-knits, and fold-overs are virtually eliminated, helping to reduce substantially the cost of scrap.

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New Machines and Appliances



PPG-IDL Color Eye

Photo-Electric Color Comparator

A SCIENTIFIC color brain accurate to within 0.5% has been developed in the research laboratories of the Pittsburgh Plate Glass Co., Pittsburgh 22, Pa., it was announced by S. Frank Cox, director of research of the company's glass division. Known as the PPG-IDL Color Eye, the new instrument photo-electrically records the response, sensitivity, and discrimination characteristics of the human eye. With greater accuracy than the eye it is said to measure color differences and divide by the total reflected light to give comparisons in terms of percentage reflectance difference, regardless of illumination level or color density.

or color density.

Developed by P. W. French, of the Pittsburgh Plate research staff, in collaboration with Instrument Development Laboratories, Inc., the new apparatus fills a long-felt need in the textile and paint industries and other industrial applications where accurate color matching has been almost solely dependent on the skillful use of the human eye. The Color Eye is more accurate than the human eye in measuring reflecting samples as well as clear or diffuse transmission samples.

The instrument's normal sample area view is one-half inch in diameter, but it can accommodate samples ranging from one inch to several feet in size. Color differences are read directly on a meter having two ranges. Approximate luminosity is read directly on a logarithmic scale from 0.1-100%. Accurate luminosity or tristimulus values may be obtained by a direct reading micrometer-controlled optical slit comparing the sample to a white standard. Colors matched or compared in the Color Eye are industrially satisfactory regardless of the detailed spectrophotometric color curve of the samples, it is claimed. The instrument will be marketed by the Instrument Development Laboratories, Inc., Williston Park, L. I., N. Y.

Injection Molding Machine

A NEW large-capacity thermoplastic injection molding machine, capable of molding 40 ounces of acetate or 32 ounces of polystyrene per cycle, has been announced by Hydraulic Press Mfg. Co. The machine molds all types of thermoplastics and was designed to broaden the scope of plastics mass production to include such parts as large radio calinets, toilet seats, and similar large-area parts.

The machine is entirely automatic, with only the removal of the molded parts being required by the operator after they have been automatically ejected from the mold. The mold clamp consists of a large hydraulic double-acting ram fitted with a small internal booster ram for the fast closing of the mold. HLST

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RLD

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THE DOVE AND THE ANT



A NAT going to a river to drink one day, fell in, and was swept along by the current. A Dove pitied her condition and threw into the river a small twig, by means of which the Ant gained the shore.

The Ant afterwards, seeing a hunter with a bow aiming at the Dove, stung him sharply on the foot, and made him miss his aim. And so the Dove's life was saved.

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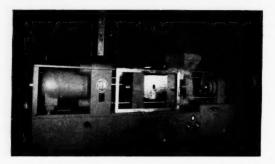
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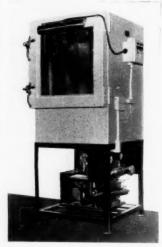
The Country's Leading Makers



New H-P-M 40-Ounce Injection Molding Machine

Die slam is eliminated by automatic slowdown just prior to mold contact. The mold opens slowly until the finished part releases itself from the stationary mold half; then mold travel is rapid. Speed is again retarded prior to ejection of molded parts to protect them from damage.

The machine weighs 82,000 pounds and is 264 inches long and 60 inches wide. The heating chamber is more than three feet long. Two Hydro-Power variable displacement radial piston-type hydraulic pumps generate the operating pressures using oil as the hydraulic pressure medium. This new 40-ounce machine is now a stock size in the H-P-M line which already includes four-, nine-, and 16-ounce capacity injection molders.



Tenney Testing Unit with Temperature and Humidity Controls

doratory Testing

A NEW, self-contained laboratory testing unit which has facilities for accurately controlling temperature and relative humidity within an 18-inch cube working space is being marketed by Tenney Engineering, Inc. The temperature within the chamber in the regular model can be varied over a range from 20 to 200° F. The maximum rate of temperature can be maintained within a tolerance of $\pm 2^{\circ}$ F. Relative humidity can be controlled either above or below ambient temperature at a minimum wetbulb temperature of 33° F. An extended surface dryexpansion coil is used to lower the temperature or relative humidity.

The conditioning equipment, mounted directly beneath the working space, includes a heating unit, vaporizer-type humidifier, and a 1/3 h.p. air-cooled compressor having the new Tenney thermostatic expansion valve in the refrigeration system. An external light provides illumina-tion of the chamber interior during testing, and an inspection port on the door affords a view of the entire chamber. Close control is provided by accurately calibrated thermostatic ele-ments and dial-type temperature indicators. Versatility of con-trol is provided by conveniently located, independent switches for heating, cooling, humidifying, and dehumidifying circuits, and the inclusion of an air-flow damper to proportion the flow of air through the heating and cooling compartments. Interiors of the working chamber are made of copper or stainless steel.

Tire Vulcanizer Air Ven

M ANY of the difficulties encountered in single-tire vulcanizing can be removed by rapid and complete elimination of air from the steam jackets. The Sarco No. 10AB Air Vent, made by Sarco Co., Inc., has been specifically designed for such use on single-tire vulcanizers. The vent gives rapid elimination of (Continued on page 430)

Ju



RETARDER PD*

RETARDER PD is a non-toxic, fine white powder with a specific gravity of approximately 1.50.

RETARDER PD gives good retarding or anti-scorch effects at processing temperatures and very little or no retarding effect at curing temperatures. It is practically non-discoloring so that it may be used in white and light colored stocks.

RETARDER PD is very effective with the thiazole type of accelerators or with combinations of the thiazole accelerators and guanidine accelerators or thiuram disulfides.

RETARDER PD has no effect on the physical properties or aging qualities of the vulcanized stocks.

RETARDER PD is not recommended for use in stocks containing high amounts of currently available reinforcing furnace blacks.

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*Reg. U. S. Pat. Off.





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June, 1948

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UNUSUAL ADVANTAGES



For Rubber Products Industries

RESOURCES and raw materials for the manufacture of of rubber products are plentiful in New Orleans—cotton, sulphur, carbon black, synthetics etc. are all produced in this area; an unlimited, uninterrupted supply of the ideal fuel, natural gas, is always available; the Port of New Orleans is the natural gateway for rubber imports.

MARKETS are closer, larger and better at New Orleans. Your rubber products plant here would serve 30,000,000 people in the 10-state Southern Market of which New Orleans is the largest city. The vast Mid-continent area and all Latin America can be easily covered at new low transportation costs.

TRANSPORTATION, whether north or south, is better from New Orleans—lower in cost by rail-water shipping through-out the Mississippi Valley; regular sailings to all Latin American and world ports; ample, efficient motor and rail service to all points.

OTHER UNUSUAL ADVANTAGES include an ample supply of cooperative labor; a mild climate conducive to year-'round production; a 10-year tax exemption plan for new and expanding industries.



SEND FOR YOUR COPY of our industrial study "New Or-leans for Manufacturers of Rubber Products". Address Dept. 65 A. Greater New Orleans, Inc., 1024 Maison Blanche Bldg., New Or-leans 16, La.

GREATER **NEW ORLEANS**

New Goods and Specialties



Goodyear's Rubber Propeller for Outboard Motors

Rubber Propeller by Goodyear

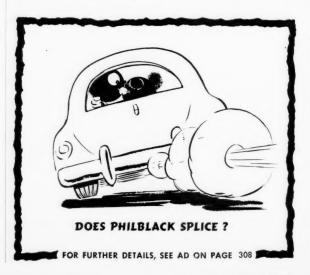
RUBBER propeller for outboard motors has been developed by the molded goods division of Goodyear Tire & Rubber Co., Akron, O. Encasing a cast aluminum or bronze core, the rubber propeller is said to be stiff enough to cut the water, yet sufficiently resilient to slide over weeds without fouling and to bounce over driftwood and other obstacles without shearing the drive shaft pin.



"Spon" Can Be Vulcanized Directly to Carpeting

New Sponge Rubber

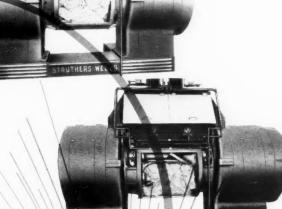
PON," a new non-inflammable, low-cost sponge rubber with important application possibilities, has been developed by Commonwealth Engineering Co. Produced from materials which



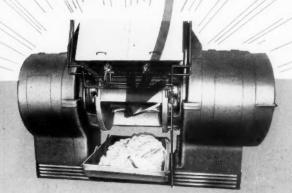
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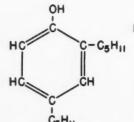
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Alkylated Phenols for the Rubber Industry



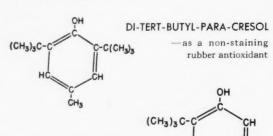
DIAMYL PHENOL

—for the production of rubber chemicals such as peptizing agents and antioxidants
—as a softening agent

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—as a softener for certain chemical rubbers, particularly when used in the production of ebonites —as a raw material for the production of rubber-processing chemicals such as antioxidants and peptizing agents



MONO-TERT-BUTYL-META-CRESOL

useful for the production of rubber chemicals

OTHER PRODUCTS

Also available from the Chemical Division are: Styrene Monomer, alpha-Methyl Styrene, and Divinylbenzene—useful in the production of GR-S chemical rubbers, specialty copolymers, and plastics; Resorcinol and Penacolite ® Resorcinol Adhesives and Resins—useful for rubber compounding and fabricating; Catechol—useful for the production of rubber antioxidants.



Koppers Company, Inc. Chemical Division, Dept. RW6 Pittsburgh 19, Pennsylvania Please send me the following bulletins:

C-7-103 Products of the Chemical Division
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T-C-8-119 Koppers Styrene Monomer

C-7-102 Koppers Divinylbenzene T-C-7-110 Koppers Diamyl Phenol

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KOPPERS COMPANY, INC. CHEMICAL DIVISION

Pittsburgh 19, Pennsylvania

are in free supply, the new product can be delivered through a hose where it sponges at the nozzle, cast in sheets or in open molds, or continuously produced at high speed in sheet form in much the same manner as paper is manufactured.

The new material's flameproof characteristics remedy an important defect of conventional sponge rubber and open many new fields of use. "Spon" can be applied and vulcanized directly to upholstery materials and the backs of rugs and carpets to provide resiliency as well as flame resistance. Vulcanized to fiberboard and boxboard, the material constitutes an economical protective lining for cartons used in the shipment of glass products, instruments, etc. "Spon" is also adaptable to construction use, being made in a simple on-the-job apparatus which delivers the material for use in insulation soundproofing, or cushioning.

Substantially oderless, "Spon" is very tough, highly resilient, and soft to the touch and gives a deep cushioning effect even in thin sections. It can be produced in a wide variety of colors and thicknesses and in both hard and soft grades. The manufacturer, an industrial research organization, is completing plans for wide licensing of the new development.



Plastic Raincoat

A NEW-TYPE raincoat for men, made of metalized Vinylite plastic that is light in weight, yet strong and durable, is being manufactured by Plymouth Rubber Co. Made of Bakelite Corp.'s Vinylite plastic, the coat is tan in color and has electronically sealed seams. The coat is vented for coolness, and the plastic, it is claimed, will not dry out, crack, or stick together. For portability and convenient storage, the raincoat can be folded compactly into a small envelope of matching material.

Extension Cord Set

A N EXTENSION cord set equipped with an unbreakable three-way plug and attachment plug cap made of soft rubber has been developed by United States Rubber Co., Rockefeller Center, New York 20, N. Y. The set will be produced in six-, nine-, and 15-foot lengths having either 1/32- or 1/64-inch rubber insulation over a No. 18 wire. The set is intended for general household use and will be merchandised through regular distribution channels to the electrical trade and consumer. Since the war U. S. Rubber has been specializing in the development of soft rubber electrical wiring devices to replace hard rubber and plastic products. The company's household set equipped with a single soft rubber outlet and attachment plug cap has attained wide popularity since its introduction some months ago.



U. S. Rubber's Extension Cord Set with Soft Rubber Insulation and Plugs

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The essence of accuracy in rubber calenders is close and constant control of the predetermined gauge of the product throughout its width and length.

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By making possible (a) maximum roll neck diameter and strength (b) maximum radial, thrust and combined load capacity, Timken D-I-T Type Balanced Proportion Bearings as shown in the drawing, help

provide the rigidity and endurance necessary for dependable, top notch performance.

In addition, Timken Bearings enable extremely fine adjustments to be made during installation, thus assuring minimum vertical movement of the calender rolls regardless of operating temperature.

The Timken Bearings furnished for these calender roll mountings are of the precision type. Rolls may be refinished when necessary without removing the bearings from the roll necks,

inaccuracies in the O.D. of the roll necks or roll barrels being compensated for by the precision of the bearings themselves.

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EUROPE

GERMANY

Early in its development the German rubber industry showed a tendency to branch off in distinct directions so that, for instance, the manufacture of tires has been the special domain of the factories in the western part of the country, while seamless (dipped) goods have been specialties of the eastern factories. Because the division was largely determined by geographic and economic causes, it made for more efficient production and profitable regional interchange of trade. But the present division of the industry, resulting chiefly from the opposed policies pursued in the eastern and western zones under occupation is causing dislocations and duplications which, a writer in Kautschuk und Gummi¹ explains, may have serious economic repercussions unless averted by a timely unification of interzonal industrial policy. He cites various recent developments which he considers symptomatic of Germany's general postwar economical and political relations and in particular of the situation in the rubber industry.

To begin with, he considers the reported proposal of the authorities in the Eastern zone to establish two new tire factories there a proposal evidently the result of the fact that Bizonia was not able in 1947 (because of shortages of coal and raw materials then prevailing) to fulfill its undertaking to supply the Eastern zone with 142,000 tires in exchange for Buna. However, tire production in the Eastern zone was always negligible; in 1940 it accounted for only 5% of the country's total tire output, with the Western zone providing 94%, so that facilities for tire production in the Eastern zone are strictly limited; the former Deka tire factory in Ketschendorf is said to be the chief, if not the only one presently in operation in the area, and its output of 6,400 tires monthly is far below local requirements. Under these conditions new factories will have to be built and fully equipped, and here the Eastern zone would be confronted with another bottleneck, since most of the works specializing in rubber machinery are in the Western zone, and it would take plenty of time to realize the additional plan of also building new machine factories

In the Western zone, productive capacity is increasing; it was reduced by war damages exclusively and not by removal of plant—as in many factories in the Eastern zone—hence it is expected that before too long the factories will have been restored and again be in a position to produce on the 1936 level, that is, 227,000 tires monthly. Present capacity is put at 170,000 to 180,000 monthly, and since official estimates place the tire needs of all Germany for the next few years at 183,400 monthly, the Western factories could cover requirements immediately conditions permitted them to utilize to the full their existing capacity.

While admitting that the tire industry in the Western zone also labors under serious handicaps, the author stresses that they are at least not worse than those in the East. He further adds that however welcome for the country as a whole industrial expansion in the Eastern zone may be, under present conditions it is desirable that efforts in this direction be diverted to those industries formerly important for the economy of the zone.

An example of an opposite trend is the development of production of seamless or dipped goods in the west. Before the war, only a few firms here produced small amounts of dipped goods as sidelines to their other surgical goods; while some half-dozen factories in the Eastern zone produced dipped goods exclusively, accounting in 1936 for 95% of the total German output of these articles valued at 11,200,000 marks. Postwar removal of plant from some of the largest of these dipped goods factories has reduced productive capacity to such an extent that the zone is now unable to supply the heavy demand from the Western zone. Consequently several factories in the latter area have decided to resume, or take up for the first time, this branch of rubber manufacture. The author foresees the danger here that when the dismantled factories in the East are once more in a position to produce to capacity, the market will be flooded with dipped goods.

Finally here is the anomaly, that in the West, Buna factories close down and natural rubber is imported; while in the East there is a surplus of Buna because, according to reports, the factories there have not enough chemicals and other accessory materials to convert Buna into rubber goods.

A further danger to sound development of the German rubber industry is seen in the possibility of a price and quality differential in goods from the East as against the same types

¹ Mar., 1948, p. 60.

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For measuring to .0005" and less, at-a-glance, anything—from hardest metal to softest rubber!

FOUR NEW MODELS of these popular precision dial micrometers are now available, in .0005", .001", and .01 mm, graduations. Range of all models is 5/16" (8 mm.). The .0005" models are especially suitable for measuring tissues, fibres, filaments, etc. FEATURES: Automatic, uniform contact pressure—

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AND SPECIAL GRADES

produced in the West and the higher costs of fuel and raw material in the East are pointed to as evidence that such a trend already exists. In the Eastern zone brown coal (lignite) is used for fuel, an inefficient material that gives 30% less heat than bituminous coal, which condition results in a corresponding increase in heating costs. Then the price of Buna, which was 2.30 marks per kilogram was raised to 4 marks per kilogram about a year ago; whereas in the West natural rubber is now selling for 2.70 marks per kilogram, which factor again raises the costs of production to manufacturers in the East. Furthermore, where synthetic rubber only is available, a difference in quality must result in those goods which are better made from natural rubber. On the other hand manufacturers who are obliged to use high-priced Buna will be tempted to cut the Buna content in their compounds and increase the amount of filler in order to reduce their costs, thereby again lowering the quality of their product.

FRANCE

Rubber plays an important part in a new method of preparing concrete under vacuum. It is known that the strength of concrete is influenced by the proportions of water and cement employed—the smaller the weight of water as compared with that of cement, the stronger the end-product. However in practice it is found that for successful application of the concrete a larger amount of water must be used in the mixture than is compatible with optimum resistance.

In a new process¹ a vacuum is utilized to suction off the excess water once the concrete has been laid; the concrete at the same time is submitted to gradual pressure as the water is removed to give it the requisite compactness. The apparatus employed for the purpose includes special flat caissons in which the large faces in contact with the concrete consist essentially of a finely periorated sheet of rubber backed by wire gauze and a metal lattice to insure good distribution of pressure. To provide a tight seal between it and the concrete, the rubber face is edged with a cylindrical border or bead of foam rubber which is crushed by the action of atmospheric pressure when the vacuum is made. The other large faces, exposed to the air, are of metal or plywood and have only the openings needed to connect the armored rubber hose of the vacuum pumps with the interior of the caissons.

At an extraordinary meeting of the Michelin concern held at Clermont-Ferrand, January 18, it was decided to increase the capital of 1,000 million francs to 1,500 million francs by issuing at par one million new B shares of 500 francs each, thus bringing the total number of B shares to 2,700,000; there are in addition 300,000 A shares. The increase in capital has been necessitated by the devaluation of the franc which has rendered the company's working capital quite inadequate to cope with increased cost of raw materials and labor, and at the same time to maintain a proper standard of efficiency and production. It was explained that last October the company had intended to issue bonds up to 1,300 million francs, but to do so authorization by the Treasury had to be secured which was finally obtained after much negotiation, but only for a greatly reduced amount and then only on condition that the company first increased its capital by cash subscription of at least 500 million francs.

The factories of the Soc. Pneumatiques et Caoutchouc Manufacture Kleber-Colombes were able to produce in 1947 tires and mechanical rubber goods to an amount corresponding to more than 59% of the total output of 1938. As compared with 1946, output for 1947 represents an increase of 30%. The company naturally suffered as a result of the strikes toward the end of 1947, but since the beginning of the current year the tomage produced has again equaled the highest figures of 1947. Work on reconstruction and modernization of plant continued during the year, and the already considerable industrial potential of the com-

pany continues to grow.

GREAT BRITAIN

The British Rubber Manufacturers' Research Association, having satisfactorily terminated a series of experiments with radio-frequency heating, is to embark on a more extensive program, the Rubber Age & Synthetics learns. The new investigations will cover:

(1). Sponge (latex or rubber).

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There is no substitute for Santocure as an accelerator for vulcanization of natural, synthetic and reclaimed rubber. This versatile Monsanto product has won wide acceptance because it saves acceleration costs, improves quality and adds a greater margin of processing safety. Furthermore, Santocure is stable in storage and requires no special technique or handling for its use in rubber or synthetics.

Santocure is available for immediate shipment in any quantity. For detailed information and samples, write to MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Building, Akron 8, Ohio. Use the convenient coupon if you prefer.

Santocure: Reg. U. S. Pat. Off.

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June, 1948

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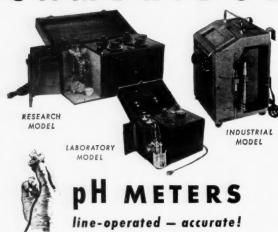
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The three models illustrated above incorporate many new and important advantages. All are AC line-operated . . . no battery nuisance. Laboratory and Research models use electron-ray tube for precise null-point indication. Industrial model is a direct-reading instrument, ruggedly built for plant use.

Accuracy: Research .02 pH, Laboratory .05 pH, Industrial .10 pH. Other line-operated Cambridge pH equipment includes single- and multipoint indicators and recorders. Send for bulletin 910-MR.

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By Appointment of Office of Rubber Reserve

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(2). Curing on a wooden roll large and thick quantities of partially cured macintosh sheet. The dimensions may vary from three feet to ten feet long and from three inches inside diameter to three feet outside diameter.

(3). Vulcanizing non-black stocks.(4). Thawing out bales of rubber from crystal condition, entailing heating up to 60-80° C

(5). Heating prior to mastication, that is, up to 120-140° C. (6). Continuing heating up to about 240° C., when the rubber should be in a suitable condition for production purposes, reducing to a minimum the milling process.

(7). Preheating rubber blanks for making large moldings, such as engine mountings, solid tires, belts, etc.
(8). Welding seams in unvulcanized rubber sheet.

The North British Rubber Co. in conjunction with the National Coal Board has been making experimental belting for coal mining, designed to give longer and better service. The use of rayon instead of cotton has been tested on a fairly large scale, and results show that rayon is less affected than cotton by moisture in damp pits. Rayon is also claimed to be stronger so that four plies of rayon can be used instead of five heavy plies of cotton, giving greater flexibility to the belting and enabling it to carry greater loads of coal. Under present conditions these findings are rendered still more important by the need here of conserving cotton.

J. G. Ingram & Sons, Ltd., London, manufacturing surgical, J. G. Ingram & Sons, Ltd., London, manufacturing surgical, mechanical, and sports goods, recently celebrated its centenary. The founder of the firm, J. G. Ingram, who left Scotland in 1847 to begin the manufacture of toy balloons in London, was a friend of Thomas Hancock with whom he used to consult about vulcanization and other rubber manufacturing problems.

Rubber Trade Directory of Great Britain, Ltd., has just been

formed to carry on the business of proprietors and publishers of journals, magazines, and newspapers, etc. The directors are B. Copeman and G. A. Smart.

P. B. Cow & Co., Ltd., reports net profits for 1947 of £249.312, subject to taxation. A final dividend of 17½% was approved, making with the interim dividend of 12½% a total of 30% for the year. The concern was incorporated in 1946 and in January, 1947, acquired the undertaking and assets of P. B. Cow (Streatham), P. B. Cow (Queensbury), Wembley Resinoids, (Streatham), P. B. Cow (Queensbury), Wembley Resinoids, and London Molders. Later in the year Elliot Equipment, Ltd., Cardiff, was also acquired to provide the company with additional selling lines and to increase its productive capacity. The various factories of the corporation operated satisfactorily and owned subsidiary. Acme Tin Stamping Co., Ltd., Manchester, also made considerable progress during the year. The retiring director, T. W. Fazakerley, was reelected.

EUROPEAN NOTES

According to European press notices, the Pirelli Holding S. A., According to European press notices, the Pirelli Holding S. A., Basle, reported a favorable balance of 1,960,000 francs for the year ended September 30, 1947; including the carry-over from the preceding year, the available balance came to 2,990,000 francs, of which 1,260,000 francs were distributed in dividends. The report also stated that Pirelli, Ltd., of England, was able to raise production levels considerably and to book increased net profits. Pirelli General Cable Works, Ltd., although handicanned by shortages of raw materials and labor, was also able capped by shortages of raw materials and labor, was also able to make good progress. The branch in Spain suffered from lack of raw materials and power. Good results were obtained by the company's Brazilian interests. In Panama the Valora A., with capital of \$120,000, was recently acquired. Pirelli's plantations in Netherlands India have been recovered.

A new rubber goods factory, said to be the largest in the Balkans, has reportedly just begun to operate at Iskra, near Sophia. Rubber footwear, automobile tires, and insulation materials are among the articles being manufactured.

The nationalized rubber and footwear industries made marked progress during 1947, the first year of Czechoslovakia's twoof the quota for the year. Production of cycle and motor cycle tires totaled 2,480,020 units, or 112% of quota; while bus and passenger-car tires came to 512,214 units, or 102.1% of quota. better idea of the increase in productivity in tires is gained when it is realized that only 1,109,000 cycle and motor cycle tires and 203,350 bus and passenger-car tires were made in 1946, that is to say, 1947 output was 224% and 252%, respectively, of that in 1946.

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'Way back then, fifty years ago, bread and meat sat open on the counters. It was about then that Standard Oil Company first started its studies and experiments in light fraction petroleum refining . . . out of which came Esso Petroleum Solvents.

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FAR EAST

INDIA

A series of publications on the rubber industry in India will be issued by the National Rubber Manufacturers' Ltd., Calcutta, with a view to disseminating relevant information and popularizing all kinds of rubber goods. The first of these, a booklet on "The Indian Rubber Industry (Planta;ion and Manufacturing)," has just come to hand. According to this booklet, the area under rubber in South India in 1942 came to 138,442 acres, of which 75% was in Travancore. Apparently the area is made up chiefly of numerous small holdings, which employed 46,887 work-

Output in the years 1939-46 fluctuated between 31,390,663 pounds in 1939 and a maximum of 38,469,760 pounds in 1944; in 1946, it was 35,105,280 pounds. Yields are low in India, averaging only 263 pounds per acre, as compared with a world average for seedlings of between 300 and 400 pounds per acre and of more than double this for budgrafts.

In line with greater home demands, exports of raw rubber we declined from the maximum of 23,327,653 pounds shipped in 1939-40; in 1942-43 only 1,250,940 pounds were exported, and in 1945-46, 5,066,000 pounds.

Rubber manufacturing was started in India in 1920 when the first fabric-proofing factory was set up in the country. How-ever, real development of the industry did not begin until the Thirties, when low prices of rubber in India and cheap labor the Thirties, when low prices of rubber in India and cheap labor encouraged the establishment of large factories by such firms as Bata, Dunlop, Firestone, and India Rubber Mfg., Ltd. The number of rubber factories now in India is variously estimated at 100, 114, and 115, with the majority in the Bombay area, Bengal, and Punjab, in that order. The total capital of the rubber companies, excluding Bata, Dunlop, and Firestone, is given as 25,000,000 rupees, and the number of employes, as 50,000. Present consumption of rubber is put at roughly 16,000 tons a year, double the prewar consumption of 8,000 tons a tons a year, double the prewar consumption of 8,000 tons a year. The factories produce a wide variety of goods, including cables, tires, footwear, mechanicals, proofed fabrics.

The following table shows estimated demand, production in 1945-46, and estimated productive capacity:

	Estimated Demand		Estimated Mfg. Capacity
Hose	5,000,000	3.500,000	7,000,000
Dipped goodstons	300	100	400
Molded goodsno.	800,000	380,000	1,000,000
Soles and heelsgross	150,000	16,000	300,000
Calendered goods tons	650	500	1,200
Extruded goodstons	4,000	400	4,600
Roller coveringsunits	2,400	1,400	2,400
Ebonite (rods, tubes, sheets) tons	120	130	150
Surgical goodstons	80	120	120
Proofed fabrics	3,780,000	1,040,000	4,200,000
Football bladders	1,800,000	1,900,000	2,200,600

Productive capacity for giant tires and tubes is put at 400,000

Productive capacity for giant tires and tubes is put at 400,000 and 440,000 units, respectively; for automobile tires and tubes, 200,000 and 220,000, respectively; cycle tires and tubes, 5,000,000 and 6,000,000 units, respectively; and fan belts, 300,000 units. Although production is increasing, permitting the export of goods to a value of 5,189,655 rupees in 1943-44, 11,359,236 rupees in 1944-45, and 8,693,538 rupees in 1945-46, it was still necessary to import goods which in 1945-46 had a value of 11,739,081 The main imports were belting, representing a value of 3,153,132 rupees in 1945-46, and insulated wires and cables, to a value of 7,702,689 rupees in the same year.

India has several advantages for manufacturing rubber goods, as availability of raw materials, ample cheap labor, and markets. But full development of possibilities is hampered by deficiencies in coal, steel, and textiles; mechanical equipment is largely old and worn out, and technical services are inadequate. Another adverse factor, as far as the rubber manufacturer is concerned, is the price of homegrown rubber has been fixed by the government at a higher level than the world market price.

JAPAN

Available figures for 1947 indicate a decline in Japanese production of certain types of rubber footwear as compared with those for 1946. In 1947, 8,107,000 pairs of rubber-soled canvas shoes were made, against 8,629,000 pairs in 1946; and only 9,704,000 pairs of the Japanese two-toed rubber-soled shoes, known

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For every product based on polyvinyl chloride and related copolymers there's a Monoplex plasticizer that's designed to provide the properties you need. The data in the table below highlight the efficiency, low-temperature flexibility, heat stability, and resistance to water extraction that you can obtain with these outstanding products . . . specify Monoplex when you think of monomeric plasticizers.

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100% Modulus (psi.)	630	630	890	910	1100
Tensile Strength (psi.)	2390	2050	2520	2310	2700
Ultimate Elongation %	290	340	320	360	340
Shore Duro A Hardness	68	66	71	76	76
Kemp Bend Brittle Point., °C.	-29	-67	-33	-62	-42
Heat Stability (Hours at 150° C.)	5	5	4	5	8
Ultra-Violet Stability (Weatherometer)	Moderate	Moderate	Good	Moderate	Good
Volatility, (% weight loss)	3.4	9.8	2.7	0.4	0.4
Water Extraction (% weight loss)	1.3	0.3	0.9	0.1	0.1
Oil Extraction, (% weight loss)	11.6	24.6	16.2	22.5	21.0

*As measured from a standard formulation:
Vinyl Resin 63.5
Plasticizer 35.0
Bosic Lead Carbonate 1.0
Stearic Acid 0.5

We'll be glad to send you full information concerning Monoplex plasticizers. Make your inquiry as detailed as you wish. Our technical

staff is always happy to suggest the proper Monoplex for a specific application.

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The NEW ALL-PURPOSE PYRO Surface Pyrometer

Designed to meet all plant and laboratory surface and sub-surface temperature measurement requirements in the Rubber Industry—one instrument with a selection of eight types of thermocouples and rigid and flexible extension arms—all interchangeable within a few seconds without

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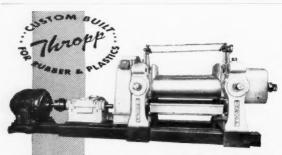
The NEW PYRO is quick-acting, light weight, and rugged. It features a large 4½" indicator, automatic cold end junction compensator, and a shielded steel shock, moisture- and dustproofed housing—all combined to offer the highest precision accuracy, dependability, and durability. Available in five standard ranges from 0-300° F. to 0-1200° F.

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Extra Heavy Duty Individual Motor Driven Mill with 15" diameter journals, having 150 H.P. enclosed herringbone gear drive. Machine is equipped with solid bronze lined hearings having oil closure seals on side of the boxes facing the rells to prevent oil contamination of the stock. Sized cut connecting gears and Johnson Rotary Joints. Mannes mechanical lubricator and new style guides bored to fit the rolls. This is just one of the many new Thropp precision built mills designed to speed up post war production.

West Coast Representativ H. M. Royal Inc. Los Angeles, Cal. Thropp

WM. R. THROPP & SONS CO.

as Jikatahi, were produced, instead of 13,777,000 pairs as in 1946. Of the former type of footwear, 668,000 pairs were exported, chiefly to Belgium, Belgian Congo, Siam, and Singapore; in addition 19,000 of the Jikatahi were exported, mainly to the United States and Hawaii. The 1947 output of rubber boots and shoes came to 728,000 pairs, all for domestic use. Comparable figures for 1946 are not available.

AUSTRALIA

The system of industrial scholarships instituted by Dunlop Rubber (Australia), Ltd., in 1947 is being extended to its Montague (Victoria) and Drummoyne (New South Wales) factories. Under the scheme, trainees selected from youths 16-19 years old are given a period of free training of not less than three years. All branches of technology, manufacturing, sales, and administration are included.

An acute shortage of tires exists in some parts of Australia, an official report states, and in trade circles it is predicted that the shortage may last four to five years. To help meet demand British tires are being sent over, among others by the Nuffield organization, which is said to be shipping large quantities.

organization, which is said to be shipping large quantities.
Goodyear Tire & Rubber (Australia) Ltd., booked a profit of £300,683 for the year ended December 31, 1947, showing an increase of £86,316 as compared with 1946. However this figure was reached after reducing tax provision by £96,000 to £225,000. The ordinary dividend, which goes to the American company, absorbs £276,000 and represents an increase from 26.4% to 36.8%. The 8% preference dividend absorbed a further £24,000. There was a carry-forward of £435,812. This company's report stated that productive capacity was being taxed by the 40-hour week and would continue so until additional plant is installed, which will probably be this year.

LEBANON

During the war 40 rubber footwear companies operated in Lebanon. Now there are five, of which four specialize in soles and heels, and the fifth in tennis shoes and rubber boots. The combined capital of the five is put at 550,000 Lebanese pounds and they employed 400 workers in 1947, who produced 80,000 pairs of heels and 250,000 pairs of combined heels and soles, in addition to 140,000 pairs of rubber shoes. In 1946 output included 100,000 pairs of heels and 306,000 pairs of combined soles and heels. The basic raw material is reclaimed rubber, mostly made from war-surplus tires, but a certain amount of natural rubber is imported from Ceylon. About half the output is for domestic use; while the remainder is exported to neighboring countries.

One Lebanese pound=46¢ U.S. currency.



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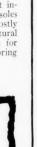


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CARBONEX* 644 Rubber Compounding



Zinc Oxide......5 Benzothiazyl Disulfide......0.75



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(Test No. 8387-ABCD from the Barrett Rubber Research Laboratory)

CARBONEX* 64

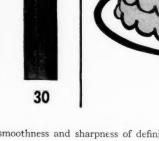
RUBBER COMPOUNDING HYDROCARBON

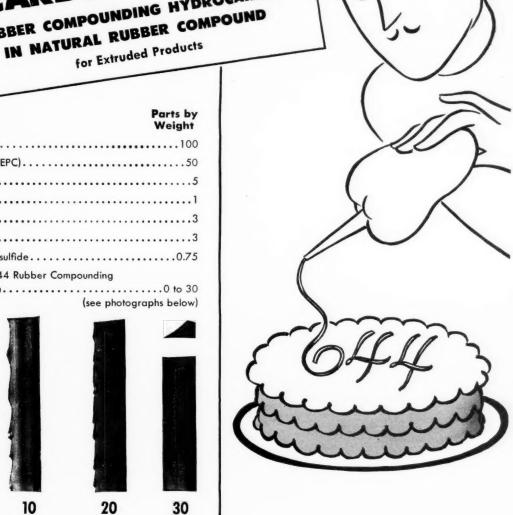
for Extruded Products

Parts by Weight









These photographs illustrate the plasticizing action of Barrett CARBONEX* 644 rubber compounding hydrocarbon when used in a test recipe containing a moderate loading of channel black. Note the effect of the hydrocarbon on the extruding properties of the elastomer.

Each increment of Barrett CARBONEX* 644 rubber compounding hydrocarbon results in progressive improvement of surface smoothness and sharpness of definition of the Garvey die extrusions.

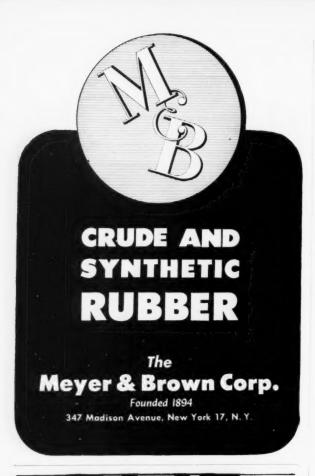
This characteristic of Barrett CARBONEX* 644 rubber compounding hydrocarbon, coupled with its moderate cost and good dispersion and processing qualities, accounts for its wide use in the design of compounds for the manufacture of calendered or extruded products where low nerve, smooth surface and sharp edges are essential.



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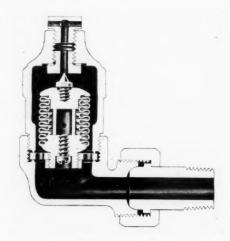
AFRICA

The British Union Rubber Mfg. Co., Ltd., has ordered machinery for a new factory in Benoni, to increase production by nearly 50%. The company manufactures various types of mechanical goods including mining hose, industrial hose, molded goods, tank linings, handle grips and the like, and also soles and heels. Recently it resumed the production of rubber boxes used in the gold and coal mines for carrying explosives underground.

Bata has a shoe factory at Gwelo, Southern Rhodesia, where it is producing increasing quantities of rubber footwear with rubber imported from Malaya. There is said to be a big demand for these goods in Southern Rhodesia, and also in other parts of Africa, among these Belgian Congo, which has been one of the company's best markets for rubber footwear. Bata makes extensive use of cheap native labor and is thus able to produce rubber footwear at a very low cost. New machinery to increase output is to be installed at Gwelo.

Tire Vulcanizer Air Vent

(Continued from page 414)



Cross-Sectional View of Sarco No. 10AB Air Vent for Single-Tire Vulcanizers

all air through an oversized orifice by means of powerful thermostatic bellows and can discharge 1.35 cubic feet of air a minute when using 50 p.s.i. of steam. The vent operates at five degrees below steam temperature. Liquid-filled and designed for snap action, the flexible bellows is as sensitive as it is rugged.

There is no spitting of steam because of the snap action of the bellows, the location of the body above the inlet line, and the safety margin of space between the top of the bellows and the orifice. The vent is of small size, being only 2)4 inches high, and does not interfere with the pipes or with removal of the tire when the upper jaw of the vulcanizer is opened. In addition to its use on tire vulcanizers, the vent can be employed to advantage wherever a small, high-pressure air vent is needed.

New Stainless Steel Pump

A NEW stainless steel pump intended primarily for use in chemical and rubber applications has been announced by the Jabsco Pump Co. Like previous Jabsco models, the pump is extremely simple in construction and has only one moving part: a tough, flexible impeller made of a neoprene compound selected for chemical inertness, toughness, and wear resistance. The resilience of the impeller gives automatic compensation for wear in the pump body and facilitates passage of suspended solids without jamming.

The pump primes automatically; operating suction is in excess of 27 inches of mercury. The self-priming feature is of particu-

(Continued on page 452)

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Specially

ENGINEERED for specific

Continental's complete range of channel and furnace blacks has been specially engineered, produced, and tested to help build maximum service into a comprehensive list of rubber end products... from tires to footwear...from belting to mechanical goods... from wire and cable jackets to motor mountings.

Look through the brief descriptions below. It may well be that one or more of these specially engineered carbon blacks will specifically benefit your product.



CARBON BLACKS CONTINENTAL

CONTINENTAL F... hard processing channel black with average particle diameter of 20 to 25 m mu. Available either compressed or in pelletized form.

CONTINENTAL A . . . medium processing channel black having 25 to 30 m mu average particle diameter. Produced as pellets or compressed.

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CONTINEX FF . . . a new furnace black having a particle size more closely approaching the range of the channel blacks than any previous furnace black.

CONTINEX HMF... high modulus furnace process carbon black with an average particle size range of from 30 to 60 m mu. Especially effective in GR-S. Manufactured compressed or as pellets.

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Accelerator 2-MT

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Has many advantages in rubber stocks

- * Resists heat and aging.
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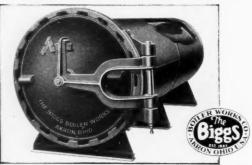


Fig. 17. Welded steam-jacketed, staybolt-less, horizontal canizer with quick-opening door. All sizes; various wor pressures. Low maintenance.

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Biggs-built vulcanizers and devulcanizers have always had a prominent place in the develop-ment of the rubber industry. For over 45 years Biggs has furnished single-shell and jacketed vulcanizers both vertical and horizontal, as well as many different types of devulcanizers. Biggs modern all-welded units with quick-opening doors are available in all sizes and for various working pressures — with many special features.

Ask for our Bulletin No. 45



Editor's Book Table

BOOK REVIEWS

"Coating and Ink Resins-A Technological Study." William Krumbhaar. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 322 pages. Price, \$7.

The resins discussed in this volume are those pure phenolics, rosin-modified phenolics, rosin-modified maleics, and copal-type synthetics used in the coating and ink industries. The presenta-tion is almost that of a narrative, and, as the author points out, The presentathe book is a technological study, not a textbook. In line with this aim, discussion of theory has been limited to that which the author believes to be supported by experimental evidence. Despite the over-simplification of some discussions of theoretical implications, the presentation of views that may not be fully accepted by other technologists in the field, and the omission of literature references to a large degree, the book is provocative and stimulating. It provides many suggestions for additional research and should prove valuable to other workers in the field of synthetic resins. As for subject matter, individual chapters deal with chemical fundamentals, phenolic resins, maleic resins, copaltype synthetics, chemical characteristics of resins, influence of resms on surface coatings, influence of resins on printing inks, the application of resins, machinery and equipment, and the patent situation. An adequate subject index is appended.

"Flameproofing Textile Fabrics." Edited by Robert W. Little. American Chemical Society Monograph Series, No. 104. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 426 pages. Price, \$6.75.

The entrance of the United States into World War II forward attention on the world of practical methods of some

focussed attention on the need of practical methods of combatting fabric inflammability for the Armed Forces. At the request of the Army Quartermaster Corps, the National Research Council established a research project on the flameproofing of Army clothing at Columbia University. results of these researches, conducted over a period of about three years, are made available in this valuable book, which also includes a great deal of related information obtained in

other service laboratories.

The subject matter is presented in the form of a comprehensive survey of the subject, rather than in the form of a technical report of the investiga ions carried out. The book is divided into three sections. The first section, on fundais divided into three sections. The first section, on fundamentals, consists of chapters defining flameproofing, on degradation of cellulose, and on mechanisms of flameproofing. The second section consists of a chapter on test methods for evaluation of flameproofing and a chapter on general flameproofing processes for cotton fabrics. The final section includes chapters on application of flameproofing to Army clothing fabrics, military equipage, and civilian fabrics. Each chapter in the book is divided into many see ions, each prepared by authorities in the field. Many photographs, charts, and diagrams are used to illustrate the text, and an adequate

"Plastics, Theory and Practice. The Technology of High Polymers." C. C. Winding and R. L. Hasche. McGraw-Hill Book Co., Inc., 300 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 290 pages. Price \$3.50.

This is a fac ual presentation of high polymer technology intended for the chemist or chemical engineer who desires to specialize in the field of plastics. As such, it presupposes a knowledge of chemistry. The text is divided into seven sections. The first section covers the formation and structure of high polymers, including classification of resins and the principles of plastic synthesis. This is followed by a section on general applications of resins to complete the background material. The ensuing sections deal with natural resins, condensation resins, polyethenic resins, silicones, and natural and synthetic rubbers. The treatment of the subject matter is comprehensive and well organized, with some 111 illustrations, including many flow sheets of production processes, used to clarify the text. Appendices include tables of comparative physical properties of plastics and rubbers, a bibliography, an index of trade names and companies, a list of visual aids for teaching plastics technology, and a subject

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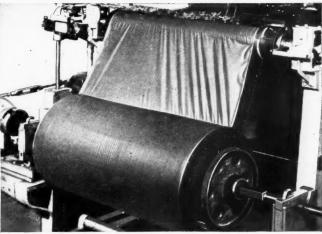
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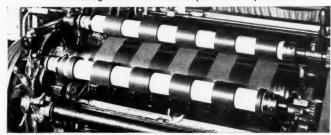
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"Colloid Science. A Symposium." Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 5½ by 8½ inches, 216 pages. Price, 86.

This is the first American edition of a symposium taken from a series of lectures given as a course in colloid science at Cambridge University. Contents include an introduction by E. K. Rideal; "Suriace Chemistry and Colloids," by A. E. Alexander; "Thermodynamics and Colloidal Systems," by D. D. Eley; "S.udy of Macromolecules by Ultracentrifuge, Electrophoresis, and Diffusion Measurements," P. Johnson; "Viscosity of Macromolecules in Solution," F. Eirich; "Kinetic Theory of High Elasticity," R. F. Tuckett; "Emulsions in Vivo," J. H. Schulman; "Study of Colloidal Systems by X-Ray Analysis," M. F. Perutz; "Membrane Equilibrium," G. S. Adair; "Infra-Red Spectra and Colloids," G. B. B. M. Sutherland; and "Vinyl Polymerization in the Liquid Phase," by R. R. Smith.

The subject matter is treated mathematically, and emphasis is on theoretical aspects, although applications in industry, biology, and medicine receive mention. Because of its relatively high mathematical level, the book may prove demanding for the student, but should be stimulative in effect. Many references to the literature are given, particularly to English work between 1935-1945, and a comprehensive index is also included.

NEW PUBLICATIONS

"The Neoprene Notebook." No. 40, March, 1948. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 8 pages. This issue of the Notebook contains stories on neoprene-cork combinations, neoprene-rayon car heater hose, neoprene coatings for chinaware molds, neoprene covered weatherproof wire, neoprene pump impellers, and a sealing device used in perforating oil well casing.

"Silicone Notes." Bulletin B 30-2. April 5, 1948. Dow Corning Corp., Midland, Mich. 8 pages. This bulletin lists the company's recommended specifications for rewinding DC motors with Dow Corning Silicone Class "H" electrical insulation. Instructions cover armatures of different types, shunt field coils, and series field coils.

"Unusual Adhesive Products." Adhesive Products Corp., 1600 Boone Ave., New York 60, N. Y. 22 pages. The company's adhesive products are described herein together with general information on their properties and applications. An illustrated section is devoted to the company's testing facilities to insure product uniformity.

"Butex in a GR-I Heat Resistant Compound." Report No. 10. April 19, 1948. Midwest Rubber Reclaiming Co., East St. Louis, Ill. 4 pages. Extensive laboratory test data are presented on the use and effect of Butex, a neutral-process Butyl inner tube reclaim, in a GR-I heat resistant compound. Formulations are given together with properties of the GR-I and Butex combination both before and after heat aging.

"Baldwin-Tate-Emery Universal Testing Machine, Models 20-35 and 60-35." Bulletin 282. The Baldwin Locomotive Works, Philadelphia 42, Pa. 4 pages. This bulletin illustrates and describes the universal testing machine available in two models and gives information on principles of operation, accessories, and specifications. These models are designed for applications where large testing spaces are not needed, where the ratio of high range to low range need not be greater than 20:1, and where accuracy within 0.75% of reading or 0.15% of range is adequate.

"Plasticizer TP-90B in Various Polymers." Technical Service Bulletin No. 104, April 14, 1948. Thiokol Corp., Tren on, N. J. 2 pages. The properties of TP-90B are given together with laboratory test data on its use in typical GR-M, GR-S, Hycar OR-15, Perbunan 26, and natural rubber smoked sheets and pale crepe formulations. The plasticizer is shown to be compatible with these rubbers, to plasticize rapidly, and to impart excellent low-temperature flexibility and resilience.

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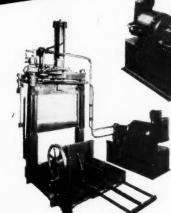
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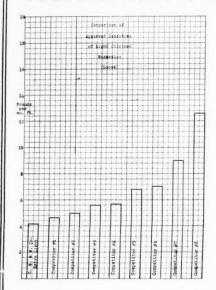
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"Swelling of Neoprene in Chemicals, Oils and Solvents." BL-223. April 15, 1948. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 16 pages. This bulletin offers data on the volume change of various neoprene compounds after immersion into some 185 different chemicals, oils, and solvents. Each entry in the listing shows immersion conditions, volume change, and a reference to the original work which includes the neoprene formulation used.

"Femco." The Falls Engineering & Machine Co., Cuyahoga Falls, O. 36 pages. This handsome and profusely illustrated booklet describes the growth of the company during the past 30 years, its present resources of manpower and equipment, and its future prospects. Many of the photographs are devoted to the operations in the manufacture of V-belt mold rings.

"Escorted Tour of B. F. Goodrich." The B. F. Goodrich Co., Akron, O. 24 pages. This handsome and profusely illustrated booklet provides a "tour" of Goodrich. The company's 21 factories are pictured and briefly described as are many manufacturing processes and product applications.

"Cleveland Speedaire Worm Gear Reduction Units." Catalog 300. The Cleveland Worm & Gear Co., Cleveland 4, O. 16 pages. This catalog describes and illustrates the company's reduction units and gives full information, dimensions, and ratings.

"The United States Market for Latex Foam." Rubber Development Bureau, 1631 K St., N.W., Washington 6, D. C. 24 pages. This bulletin, based on a study conducted by National Analysts, Inc., completed in December, 1947, summarizes the results obtained in personal interviews with more than 2,400 consumers, distributers, and manufacturers on the subject of latex foam and its market in the United States.

"Indonex Plasticizers in Mechanical Goods Compounds for High Temperature Curing." Circular No. 13-21, April 15, 1948. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80. 6 pages. Information and extensive test data are presented on the use of Indonex plasticizers in two natural rubber formulations using various accelerators and curing cycles.

"Pneumix, The Air Motored Agitator." Eclipse Air Brush Co., Newark 7, N. J. 4 pages. "Continuous Measurement and Control of Roll Surface Temperature." Bulletin 405. Foxboro Co., Foxboro, Mass. 4 pages. "Effect of Simulated Service Conditions on Plastics." W. A. Crouse, D. C. Caudill, F. W. Reinhart. National Advisory Committee on Aeronautics, Tech. Note No. 1240. (1947) 21 pages. Publications of Underwriters' Laboratories, Inc., Chicago 11, Ill.: "Annual Report for 1947." 27 pages. "List of Inspected Fire Protection Equipment and Materials." January, 1948. 192 pages. "Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials." February, 1948. 80 pages. Publications of Converse Rubber Co., Malden, Mass. "Converse 'Chuck' Taylor Athletic Footwear, for Basketball, Tennis, Gym. 1948." 8 pages. "Converse Sporting Footwear, for Fishing and Hunting, 1948." Footwear, for Basketball, Tennis, Gym, 1948." 8 pages. "Converse Sporting Footwear, for Fishing and Hunting, 1948." 8 pages. "Flodar Tube Fittings." Flodar Corp., Cleveland, O. 10 pages. "Price List of American Standards." American Standards Association, New York 17, N. Y. 24 pages. "Prospects for Companies in The Heating, Plumbing and Air Conditioning Industries." E. W. Axe & Co., Inc., New York 19, N. Y. 50 pages. "Low-Level Educator Condensers." Bulletin 5-B. 50 pages. "Low-Level Educator Condensers." Bulletin 5-B, March, 1948. Schutte & Koerting Co., Philadelphia 22, Pa. 7 pages. Publication of Rubber-Stichting, Delft, Holland: No. 67, by G. J. van der Bie: "Mixing Latex and Portland Cement." 16 pages.

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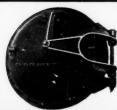
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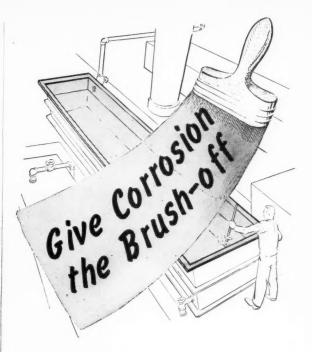
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The Johnson Joint was designed to go after the old stuffing box and steam fit troubles in a business-like way, and it literally knocks the stuffing out of them. There's no packing of any kind. There's no oiling required, ever. There's no adjusting — the higher the pressure, the tighter the seal. There's little to fear from misalignment — with provision for both lateral and angular movement built right in. Note besides how neatly it provides for more efficient syphon drainage, through the same head that admits the steam.

In dollars and cents, what does all this add up to? Well ... enough at least to pay the cost of switching over to Johnson Joints in just a short while. Enough certainly to make the Johnson Joint too big to overlook.

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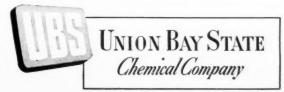




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Market Reviews

CRUDE RUBBER

Commodity Exchange

		WEER	END	CLOSIN	G PRIC	ES	
		Mar.	May 1	May 8	May 15	May 22	May 29
May		20.52	22.85	23.25	23.15	23.95	22,31
June		20,30	21.80	22.75	22.60	22.911	21.85
July		20.20	21.20	22.05	22.06	21.90	21.75
Aug.		20,00	20.80	21.55	21.70	21.80	31.05
Sept.		19,90	20.70	21.45	21.60	21.70	21.60
Oct.		19.80	20.60	21,40	21.52	21.55	21.55
Nov.		19.80	20,55	21.35	21.44	21.45	21.45
Dec.		19.80	20.50	21,30	21.36	21.35	21.40
1949							
Jan.	May	19.80	20.50	21.30	21.36	21.35	21,30
June-	July		20.50	21.30	21.36	21.35	21,20

TRADING in rubber futures on the Commodity Exchange during May was very thin and consisted mainly of dealer operations. The total volume of sales for the month was 19,170 tons, as compared with the also non-impressive total of 25,-100 tons during April. Despite this dullness in demand, prices were at high levels. based on the strong positions of the London and the Singapore markets, which reported active demand from the Continent.

June futures opened the month at 21.95c. rose and fluctuated in the 22.00-22.80e range for the next two weeks, reached the high of 23.22e on May 19, fell back to 21.75e and closed the month at 22.30e after May went off the board. Toward the end of May a reaction set in, and prices declined especially in the people. prices declined, especially in the nearby positions. This weakness was said to be a technical reaction to the top-heavy situation in nearby deliveries and was emphasized by a wave of commission house selling and profit-taking.

In addition to the strong Continental demand which pushed Far Eastern and London markets up to levels above those in New York in some cases, the strong position of the domestic rubber markets could also be attributed to the rise in tire output and expectations that domestic consumers would soon enter the market in greater strength than they have displayed in recent months.

New York Outside Market

					May 22				
No. 1 R.S.S.									
May	20.63	23.25	23.50	23.50	23.75	22,75			
June	20,50	22.25	22.75	23.00	23.00	22.63			
July Sept.	201.38	21.63	22.00	22.25	22.50	22,25			
No. 3 R.S.S.	18.88	20.50	21.00	20.75	21.50	21.00			
No. 2 Brown Flat Bark	13.13	12.50	12.75	17,25	18,23	18,00			

WEEK-END CLOSING PRICES

RUBBER trading on the New York Outside Market was rather quiet last month. Factory interest varied between light and moderate, with occasional spurts of heavier volume purchasing, particularly from the larger consumer. Offerings from the Far East were generally adequate, despite strong Continental demand and the dock strikes at Singapore and Swettenham ports. The strong European demand served to firm the Far Eastern prices, especially for the better rubber grades.

The spot price for No. 1 Ribbed Smoked

Sheet began the month at 23.50¢ on May 3, held at 23.75¢ for the next three days, then fluctuated between 23.25¢ and 23.50¢ until May 18, when it again rose to 23.75¢. After holding at 23.75¢ until May 21, the market underwent a technical adjustment following the futures market decline, and the price fell off somewhat, closing the month at 22.75c.

Demand continued to be centered in nearby deliveries and in the No. 1 grade, despite the relatively larger advance in the nearby positions as compared with the more distant deliveries. Trade sources expressed the opinion that the noticeable upturn in big factory interest would continue as a result of increased tire production. As in previous months, little demand was apparent for the lower quality grades, and their prices fluctuated within a relatively narrow range. No. 3 sheets moved between 20.25¢ and 21.50¢ during the month; No. 2 Brown fluctuated between 17.00¢ and 18.25¢; and Flat Bark held within the 12.25-13.00¢ range.

THE price of *Herea* latex declined during May, and concentrates in tank car lots sold at approximately 27.75¢ a pound, according to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's May Rubber Report. These lower prices should stimulate consumption, and some such increase is expected. To have substantial increases in consumption it is necessary to replace GR-S latex in volume outlets, but even at its lower price *Hevea* does not yet compare favorably with 18.50-20.25¢ GR-S latex despite the premium it can command.

The Herea latex price drop has also had the effect of further narrowing its premium over smoked sheet. With No. 1 R.S.S. selling at approximately 23¢ a pound, the premium for latex has nar-rowed to the point where its production may not be considered economically desirable. Bearing out this point are reports from the Far East that some producers are considering converting their liquid latex output to smoked sheets which are both easier and cheaper to produce

and ship.
Mr. Nolan gives March consumption of Herea latex as 2.135 long tons, dry weight. This is the highest recorded postwar con-This is the highest recorded postwar consumption, and April is expected to show another small increase. March imports of Herea latex were 3,193 long tons, dry weight, and stocks at the end of the month were 8,045 long tons, dry weight. The production of GR-S latex during April totaled 1,900 long tons, dry weight, an increase of 100 tons over the March figure. Neoprene latex production during April was 542 long tons, dry weight. The prices of GR-S and neoprene latices are un-

Fixed Government Prices*

Guayule (carload lots)\$0.171/2

Latext									
Hevea.	normal	(tank	car	lots)					.303/
Centr	ifuged	(tank	car	lots)	 				.321/

(GR-S, Type 2 (tank car lots) (Carload, drums) (Less carload, drums) Types 3 and 4 (tank car lots) (Carload, drums) (Less carload, drums) Type 5 (tank car lots) (Carload, drums) (Less carload, drums)	.18½‡ .268 .273 .18½‡ .26 .26½ .20¼‡ .27¾ .27¾
No. 1X Ribbed Smoked Sheets 1N Thick Pale Latex Crepe 1 Thick Pale Latex Crepe 2 Thick Pale Latex Crepe 3 Thick Pale Latex Crepe 3 Thick Pale Latex Crepe 1X Thin Pale Latex Crepe 2 Thin Pale Latex Crepe 2 Thin Pale Latex Crepe 3 Thin Pale Latex Crepe 4 Thin Pale Latex Crepe 5 Thin Pale Latex Crepe 6 Thin Pale Latex Crepe 17 Thin Pale Latex Crepe 18 Crepe Trimmings 19 Thin Pale Latex Crepe Trimmings 10 Thin Pale Latex Crepe Trimmings 10 Thin Pale Latex Crepe Trimmings 10 Thin Pale Latex Crepe 10 Thin Pale Latex Crepe 11 Thin Pale Latex Crepe 12 Thin Pale Latex Crepe 13 Remilled Blankets (Amber) 15 Relided Blankets (Amber) 16 Relided Blankets (Amber) 17 Relided Blankets (Amber) 18 Relided Blankets (Amber)	.23 .29 .28 ½ .28 ½ .29 .28 ½ .29 .28 ½ .28 ½ .28 ½ .30 78 .31 78 .32 3 ½ .21 78 .21 78 .21 78 .21 3 ½
	.103
Synthetic Rubber GR-M (Neoprene GN) GR-M-10 (Neoprene GN-A) GR-S (Buna S) GR-I (Butyl)	.32 .32 .181/2 .181/2
Wild Rubber	
Upriver Coarse (crude) (Washed and dried) Islands Fine (crude) (Washed and dried) Caucho Ball (crude) (Washed and dried) Mangabiera (crude) (Washed and dried)	.125/8 .201/4 .145/8 .221/2 .115/8 .191/2 .081/2

For a complete list of all grades of dry rubbers see Rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended. Prices per pound total solids.

Plus average freight charge of 0.75¢ per pound dry weight.

RECLAIMED RUBBER

CONDITIONS in the reclaimed rub-ber market during May remained un-changed from those reported in our pre-vious review. Production and demand were both good, although no increase in demand was apparent from the introduction of second- and third-line tires.

Final February and preliminary March statistics on the reclaimed rubber industry are now available. Production of reclaim during February totaled 23,678 long tons; consumption, 22,374 long tons; exports, 1.273 long tons; and month-end stocks, 38,444 long tons. Preliminary figures for March show a production of 24,083 long tons; consumption, 24,719 long tons; expects 272 long tons; expects 273 long tons; expects 273 long tons; expects 274 long tons; expects 275 long tons; exp ports, 937 long tons; and end-of-month stocks, 38,657 long tons.

There were no changes in reclaimed rub-ber prices during May, and current prices are listed below:

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8 / 8.5
Peel		9 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.25
Red		13.5 /14
GR-S		9.5 /10
Butyl		8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacture produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

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SCRAP RUBBER

THE scrap rubber market saw only limited activity during May as reclaimers either stayed out of the market or bought in very restricted quantities. Previously quoted prices were still in effect despite the market dullness.

Mixed tubes had only routine business transacted, and the movement of red and black tubes was virtually at a standstill, particularly in the East. Dealers reported that it was becoming increasingly difficult to move peelings, even the No. 1 natural

grade.

Export business fell off somewhat al-though the flow of supplies was still fairly substantial. Most traders believed this lull to be temporary since foreign buyers were still showing firm interest in scrap rubber, but were being hampered by import license and credit restrictions. Credit difficulties should be alleviated by ERP, and a pick-up in export business should take place when

the plan goes into effect.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered to

mills at points indicated:

	Points	
Mixed auto tires S.A.G. passenger (natural). Truck (natural) Peelings (natural), No. 1. No. 2. No. 3.	\$13.00 nom. nom. 50.00	\$13.00
	(cp	er Lb.)
Mixed auto tubes Red passenger tubes Black passenger tubes Truck tubes Mixed puncture-proof tubes Air brake hose	4.25 7.25 5.00 4.75 0.50 nom.	4,25 7,25 5,00 4,75 0,50 nom.

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Mar. 27				May 15	
Iuly Sept Nov	32,49	34.33	34.10	34.46	35.34	35.02
Mar May July	30.34	31.91	31.32	32.13	32.93	32.43

THE cotton market during May was thin, with most of the activity professional in nature. Market undertones were nervous, and speculative interest was rife. Most traders and mills stayed out of the market, waiting to see what the effect of ECA cotton purchases would be. Price levels remained high despite irregular trading, and fluctuations took place within a

relatively narrow range

The 15/16-inch middling spot price was 38.48¢ on May 1, fluctuated irregularly in the face of a nervous market, then began to rise as speculative interest increased with reports of early ECA buying, nearby shipments to Japan under the semi-private credit arrangement, and rumors of credit requests from China, Spain, and other countries for the purchase of cotton. This speculative covering coupled with price fixing for mill and foreign demand and a strong stock market resulted in monthly high spot cotton price of 39.14¢ on May 15. Prices remained at the 39.00¢ level for the next week, then fell off with reports that ECA was halting all European

purchases of cotton in order to establish a sound procurement policy. This move by ECA was also seen as an attempt to keep the lid on domestic cotton prices by delaying purchases until the new crop appears. This crop is reported to be large and in conjunction with a greater than normal carryover of old cotton should help keep prices at reasonable levels. At the close of the month the spot price was 38.92c.

Although no official announcement was made, it was reported that the initial purchases and shipments of cotton under ECA would consist of the following: Italy, 115,000 bales; France, 46,000 bales; England, 2,000 bales; Norway, 1,500 bales; and Austria, 2,500 bales.

Trading in the cotton gray goods market last month was characterized by slow sales and softened prices in some categor-With the exception of drills and twills most fabrics were in the doldrums. The market was said to be going through a period of adjustment in which buyers were coming around to the policy of purchasing for shorter periods ahead. Goods in most categories were readily available in the current market, and inquiries were

made mostly for nearby deliveries.

A good volume of business in most drills and twills was recorded for delivery through the third quarter. There some easing in supply of certain drills for third-quarter delivery, and a few price decreases took place. The osnaburg market was extremely listless, and many producers were either considering switching looms off these fabrics or had already

done so.

Trading in all classes of sheetings was also dull, and many manufacturers were facing the problem of whether to continue production of sheetings at a normal rate and pile them up in stock or to curtail production to some extent. Most mills were banking on a strong revival in sheeting demand within the next month and were therefore loath to reduce production. The movement of print cloths was slow, and almost no interest was displayed in fourth-quarter deliveries.

Demand for tire fabrics was slow be-cause of the dull overall tire situation, while the movement of hose and belting duck showed some slowdown as a result of the coal miner's strike. There was some evidence of increased government buying, and the artificial leather business continued at an active pace. The rainwear trade was quite busy as a result of the recent con-

tinuing heavy rainfall.

RAYON

D OMESTIC rayon shipments during April totaled 89,500,000 pounds, 1% below the March level. Deliveries in the first four months of the year reached 352,700,000 pounds, 16% above the corresponding 1947 period. Rayon filament yarn shipments in April were 67,200,000 pounds and consisted of 44,600,000 pounds viscose and cupra and 22,600,000 pounds acetate. Rayon staple plus tow shipments in April were 22.300,000 pounds, also 1% below the March level. Total rayon filament yarn stocks held by producers at the end of April amounted to 9,100,000 pounds, of which 6,500,000 pounds were viscose

and cupra yarn and 2,600,000 pounds were acetate varn.

Rayon production in the first quarter of 1948 totaled 268,300,000 pounds, 16% and 3% higher than the first and last quarters, respectively, of 1947 and the seventh consecutive quarter that the industry has established a new quarterly production record. If this rate is maintained for the balance of the year, an annual rate of well over one billion pounds is in pros-Deliveries of filament varu to domestic consumers in the first quarter of this year also broke all previous records with a total of 197.100,000 pounds, exceeding the last quarter of 1947 by 4%. Firs,-quarter yarn shipments to tire manufacturers were 57,700,000 pounds, slightly below the last-quarter 1947 total, but 3% higher than the corresponding period a year ago.

Beaunit Mills, Inc., announced during April that it intends to build a rayon yarn plant at Childersburg, Ala. plant will have an annual capacity of 10,-000,000 pounds of viscose filament yarn and is expected to be in operation by January 1, 1949. United Rayon Corp., New York, a newly organized company, also announced plans to construct a new rayon producing plant at a site not yet named. The proposed annual capacity of this plant is placed at 4,000,000 pounds of viscose filament yarn and 8,000,000 pounds of vis-

cose staple.

Kube-Kut Sawdust

UBE-CUT sawdust, under the name of Kube-Kut, has been developed by Michael Wood Products, Inc., for drying and polishing plastics, metals, and other materials. The sawdust is made from green maple, is screened to insure uniformity of particle size and elimination of bark, and is thoroughly dried. The absence of elongated slivers makes the material easy to shake free from products which it is used to polish or dry. It does not pulverize readily in tumbling operations and is also said to leave no film on the surface of the product being tumbled. In addition to its uses in polishing and drying, Kube-Kut is also suitable for application as a fibrous filler in phenolic plastics. The sawdust is available in a variety of meshes to suit individual needs and is packed in 50-pound bags.

Styron Sheet Stock

FULL production on Styron sheet stock developed for low-cost transparent containers has been announced by the plastics division of Willson Magazine Camera Co., Philadelphia, Pa. Made from Dow Chemical Co.'s Styron polystyrene resin, sheets are produced in thicknesses of 1/16-, 3/32-, 1/8-, and 3/16-inch. The economic factor of Styron sheet, together with the plastic's properties of low water absorption, dimensional stability, mechanical strength, and other inherent properties has created a demand for it by manufacturers in the fields of refrigeration, fluorescent lighting, display, aircraft, automobiles, communications, packaging, and others, Willson reports. Present production is geared to 2,000 square feet a day, regardless of thickness, and the sheet is available in both clear and opaque types in a wide range of colors.

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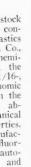
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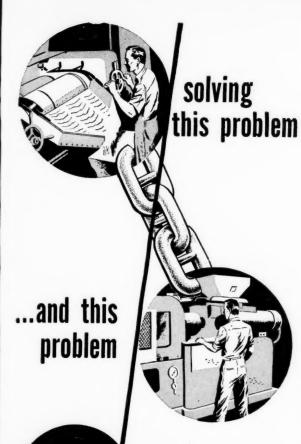
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Abrasives			Zinc oxide, comml.†lb.		/ .135	B.R.T. No. 3	.0175 $.0225$.018
Pumicestone, powdered/ Rottenstone, domestic/	b. \$0.033, on 36.00	\$0.0425 43.00	Accelerator-Activators, Or Barak	-			.0220		.00
			D-B-Alb.	1.95	/ **	Carbon Blacks Conductive Channel—CC			
Accelerators, Organic			Emery's 0-18 Elainelb.	.255	/ .52 .375	Continental R-20, -40 lb.	.055		.10
A-10	lb40 lb52	.47	Guantal	.43	.43	Kosmos/Dixielb. Spheron Clb.	.15 .12		.183
A-19 A-32 A-77 A-100	lb59	.69	Lead oleate	.33	/ .35	I. lb. N. lb. Voltex lb.	.10		.145
A-100	lh42 lb42	.55	MODX	.295 .35	/ .345	Voltexlb.	.15	1	.18
Accelerator 8 49 552		.45	Plastone	.27	4 .30	Easy Processing Channel—E			
552 808	lb. 1.63 lb59	.61	Stearic acid, single pressed .lb.	.305	/ .15%	Kosmobile 77 / Dixiedensed	.055	1	.10:
833	10. 1.13	1.15	Double pressed lb. Triple pressed lb.	.31 .3325	/ .32	77 /h	.07	1	.112
Acrin Advan Aero AC 50	lb55	***	Stearite	.14 7/8	/ .59	Spheron #9	.07	1	.117
		.56	Zinc stearatelb.	.48	/ .49	Witco #12	.055	1	.102
Altax Antox Arazate Beutene	lb35 lb54	.445				Hard Processing Channel—H	IPC		
Arazate	lb. 2.16 lb59	.64	Alkalies	9.05	5.70	Continental F	.055	1	.102
D-J-F	10	.32	Caustic soda, flake 100 lbs. Liquid, 50% 100 lbs. Solid	$\frac{3.25}{2.15}$	5.70 2.30	HX	.07		.115
Butasan Butazate Butyl Eight	lb. 1.00	1.05	Solid100 lbs.	2.85	5.30	Micronex Mk. IIlb. Spheron #4lb.	.07		.112
Limate	1.00	1.05	Antioxidants			Witco *6lb.	.555	1	.102
antax	16 27	.345		2.20	2.30	Medium Processing Channel			
P-B. Sumate	lb. 1.45 lb60	.62	Gellb. H.Plb. Hiparlb.	.58 .76	/ .60 .78	Arrow TX	.07 $.055$	1	.115
Cuprax Diesterex N DOTG (diorthotolyl-	lb50	.57	Powder	.43	.45	Kosmobile S-66 Dixiedensed	.07	1	.112
		.50	Resin	.60 .43	.62	S-66	.07	1	.112
DPG (diphenylguanidine) El-Sixty	h39 b39	.45	Stalite	.43 1.35	1.45	Spheron =6	$.07 \\ .055$	1	.117
Masan	0. 1.10		White	.58 .69	/ .60 .74	Conductive Furnace—CF			
Sthazate Sthyl Thiurad	lb. 1.25 lb. 1.00		Albasan	.43	/ .52	Statex A	.08		.10
Tuex	lb. 1.00		Antisol	.23	.24	Sterling I	.09	1	
Ethylidine aniline.	lb. 1.00	.43	Aranox	2.15	.70	Fast Extruding Furnace—FEF Statex M	.055	1	.095
ormaniline Good-Rite Erie	lb36 b53	.37	B-L-E	.43 .61	.52 .70		,000		1000
tepteen	b42	.48 1.90	B-X-A	.43	.52	Fine Furnace—FF Statex Blb.	.0575		.097
Base edate M-B-T	b. 1.00		Deen x	1.75 .95	1.85	Sterling 99	.065 $.0732$	1	.105 .117
U-D-1-D-1-D-1	.00	.33	Flexamine	.43	.50	Vulcanlb.	.0732	1	.117
Methasan	h 1.20		Heliozone	.25	,26	High Abrasion Furnace—HAI	F		
Methyl Selenac	b. 1.60		wax, amber	.14 .135	/ .16 .155	Philblack Olb.	.07	1	.113
Zimate	b. 1.00		Black lb. Yellow lb. Neozone (standard) lb.	.155	.175	High Elongation Furnace—HI	EF		
Ionex Iono-Thiurad	b. 1.10 b. 1.25		A	.66 .43	.68	Sterling Klb.	.05	/	.09
		.58	D	.47	.49	High Modulus Furnace—HMF			
P. X-A-F I Flour I Flo	b74 b1225	.84	Distilled lb. Parazone lb. Perflectol lb.	.48 .68	.50	Continex HMF	.05 .05	4	.075
ermalux	b. 1.18 b40	1.20 .45	Perflectol	.58	.65	Kosmos 50 / Dixie 50 lb.	.055	4	.095 $.075$
henex ipazate		.40	Permalux .lb. Rio Resin .lb. Santoflex B .lb.	1.53	1.55	Modulex lb. Philblack A lb. Statex 93 lb.	.0525 $.05$	1	.095
orax	007	.42	BA	.57	.50	Sterling Llb.	.05	1,	.09
57, 62, 67, 77	b. 1.10 b. 1.00		Santovar-A	1.30 1.40	1.37 1.52	SOlb.	.055		.090
00	7. 1.45			.32	.34 1.95	Reinforcing Furnace—RF Kosmos 60/Dixie 60lb.	.0732	1	.115
afex	b53	.60	Solux lb. Stabilate lb. Alba lb.	1.93	.50			.1	.110
elazate	1.40		10.	.69 .48	.74	Semi-Reinforcing Furnace—SR Continex SRF	.035		.055
PDX-GH	004	.69	Sunproof	.25	.30	Essex	.035 $.035$	1	.055 $.075$
ellurac letrone l A l	b. 1.25 b. 1.85		Thermofley 1h	.18 1.48	.23 1.50	Gastexlb.	.035	1	.075
hiocarbanilide !! hiofide !! hionex !	b34 b35	.39	Alb.	.76	* .78	Kosmos 20/Dixie 20lb. Pelletexlb.	.035	1	.075
hionex	b. 1.10		A	.50	* .56 / .59	Sterling NS, R, Slb.	.035	/	.075
hiotax l	b27 b. 1.25	.34	Tysonite	.215 .43	.2225	Very Fine Furnace—VFF	.0732	,	.1125
hiurad / hiuram E / hi	b. 1.00 b. 1.10		Zenitelb.	.37	.39	Statex Klb.	.0732	+	.1120
rimene le Base le	54	1.18	Antiseptics			Fine Thermal—FT P-33lb.	.05		
riphenylguanidine(TPG) /	. 45	.50	Copper naphthenate,6-8% lb.	.225	1.40	Medium Thermal—MT			
uex		.60	G-4	4.50	1.40 4.75	Thermaxlb.	.03		
ltex	1.00	1.05	Pentachlorophenollb. Resorcinol, technicallb. Zine naphthenate, 8-10%. lb.	.68	.25	Chemical Stabilizers			
Blend B	555 552	.62	Zine naphthenate, 8-10%. lb.	.2125		Lead stearatelb.	.48	1	.49
reka	45	100	Blowing Agents			Vanstay	.38		.40 .20
-B-X		.35	Ammonium, bicarbonate . lb. Carbonate lb.	.064	.0975 .1225	Colors			
A	42	.44	Sodium bicarbonate . 100 lbs.	1.85	2.35	Black			
Special ll	34	/ .36	Carbonate, technical 100lbs. Sponge Pastelb.	1.08	4.13	Black Paste #25	.22		.40
analoustes Katimatess To	organic		Unicel	1.00		BK Iron Oxides lb. Lampblack, comml lb.	.07		.11
ccelerator-Activators, In						Superjetlb.	.0675		.1025
me hydratedton	8.00	12.25	*Drigge in general are for h work	s Range	indicates	Mapicolb.	.0975		
me hydrated ton tharge, comml !!! Eagle, sublimed !!	1925	.2025	*Prices in general are f.o.b. work grade or quantity variations	s. Range Space 1	indicates limitation	Mapico	.0975 $.0315$	1	.0675
me hydrated ton tharge, comml !h	1925 .2025 .2025 .2125	.2025	*Prices in general are f.o.b. work grade or quantity variations prevents listing of all known are not guaranteed; contact prices.	s. Space l ingredient	limitation ts. Prices	Mapico		1	

Bonding Agents	e= 0=		07.75
M DI	3.60 6.75	1	\$7.75 3.85 8.00
Brake Lining Saturants	0.00		
B.R.T. No. 3	.0225	1	$.0185 \\ .03$
Carbon Blacks Conductive Channel—CC			
Continental R-20, -40lb.	.055		.102
Kosmos/Dixie	.15 .12		.185 .165
Ilb.	.10	3	.145
I	.22 .15	1	.25 .185
Easy Processing Channel—El	PC		100
Continental AA	.660.	1	.102
77	.07	1	.1125 $.1125$
Spheron #9lb.	.07 .055	1	.117
Witco #12	.07	1	.115
Hard Processing Channel—H. Continental F .lb. HX .b. Kosmobile S / Dixiedensed S/b. .lb. Micronex Mk. II .lb. Spheron ≠4 .lb. Witco ≠6 .lb.	PC		
Continental F	.055	171111	.102 .115
Kosmobile S/Dixiedensed Slb.	.07		.1125
Micronex Mk. 11	.07		.1125 .117
Witco *6lb.	.555	1	.102
Medium Processing Channel	-MPC	,	.115
Arrow TX lb. Continental A lb. Kosmobile S-66 Dixiedensed S-66 lb.	.055	1	.102
S-66	.07	/	.1125
S-66	.07 .07 .07 .055	1,	.1125
Witco #1lb.	.055	1	.102
Conductive Furnace—CF			
Statex A	.08		.10
Fast Extruding Furnace—FEF		1	
Statex Mlb.		1	.095
Fine Furnace—FF	0.555		00==
Statex B	.0575 .065 .0732	1	$0975 \\ 105$
Statex B lb. Sterling 99 .lb. 105 .lb. Vulcan .lb.	.0732 $.0732$	1	.117
High Abrasion Furnace—HAF			
Philblack Olb.		1	.1132
High Elongation Furnace—HE	F		
Sterling Klb.	.05	1	.09
High Modulus Furnace—HMF			
Continex HMF	.05 .05 .055	1	.075
Kosmos 50/Dixie 50lb.	.055 .05	1	.095 $.075$
Philblack Alb.	.0525	1	.095
Continex HMF 3b. Cosmos 40 Dixie 40 4b. Cosmos 50 Dixie 50 4b. Modulex 4b. Philblack A 4b. States 93 4b. Sterling L 4b. SO 4b.	.05 .05		.09
SOlb.	.055	1	.095
Reinforcing Furnace—RF Cosmos 60 Dixie 60 lb.	0500	,	.115
Semi-Reinforcing Furnace—SRI Continex SRFlb.	.035		.055 .055 .075 .075 .075 .075 .075
Essex	.035	1	.055
Bastex	.035	1	.075
Continex SRF lb. Ssex lb. vurnex lb. castex lb. Cosmos 20/Dixie 20 lb. elletex lb. sterling NS, R, S lb.	.035	1	.075
	.035	/	.075
Very Fine Furnace—VFF tatex Klb.	0729	,	1195
ine Thermal—FT	.0102	1	.1120
	.05		
Medium Thermal—MT			
hermaxlb.	.03		
Chemical Stabilizers			
ead stearate lb. anstay lb. White lead, basic lb.	.48	1	.49 .40 .20
Vhite lead, basiclb.	.19		.20
Colors			
lack	0.0		40
BK Iron Oxides	.03		.11
ampblack, comml lb.	.07		.30
Black Paste #25 lb lK Iron Oxides lb ampblack, comml lb Superjet lb Iapico lb IB Mineral Blacks lb	.0975		.10 .0675
	.0315	1	.0670
lue Du Pont /b	945		3.95
Ou Pont	.80		$3.95 \\ 1.45$

Stan-Tone	\$1.00 .30	1	\$1.55 3 .5 0	Dielex B lb. Factice, Amberex lb. Brown lb.	.337	1	\$0,416 .3335	Factice dispersions lb. Laton L lb. Marmix lb.	.075	\$0.49 .0775 .43
Brown Paste #5, #10lb. Iron oxide, brownlb.	.35 .0375	1	.45 .12	Neophax	.19 .144	1	.356 $.351$	Micronex, colloidal lb. NA-11 lb.	.06 .65	.07
Mapico		1	.0325	Black Diamondton Extender 600lb.	25.00 .18	1	30.00	P-242 lb. P-253 lb. P.370 lb.	.25 .15 .145	.35
Plastics brown	.0565 $.0475$	1	.065 .15	Hard Hydrocarbonton No. 38ton	$\frac{42.00}{25.00}$	1	44.00	P-398 lb. pHR Latex Chemical lb.	2.40	.175
Raw	0.055 0.055	1	.115 .0675	Parmr	.04	1	29.00	R-2 Crystals	1.63 1.55	
Rawlb.	.0575	1	.0625	Rubber substitute, brown .lb.	.065	1,	.317	Santomerse D	.13 .43	.65
Chrome	.10 .32	1,	.4425 .385	White	.16 .41 .025	,	.33	Setsit No. 5	.13 .75	1.00
Du Pont	1.10	1	3.20	Vinsol Resin	.32	1	.36	Stablex G. lb. L. lb. T. gal.	.60 .30 .95	.70
G-4099 lb. G-5299, -6099 lb. G-7599 lb.	.315 .38	1	.32 .385	Fillers, Inert				Sulfur Dispersion, 50%. lb.	.07	/ .15
G-9869	.75 .85	1	.90 1.00	Asbestos fiber ton Barytes, floated, white ton	$25.50 \\ 33.30$	4	$76.50 \\ 46.25$	Tergitol wetting agents lb.	.55 .265	.37
Heveatex pastes lb. Stan-Tone lb. Toners lb.	.95 1.50 .35	1	$\frac{1.85}{3.30}$ $\frac{4.00}{4.00}$	Off-color, domestic ton No. 1 ton 2 ton	19.00 33.35	1	$\frac{20.00}{47.75}$	Zinc oxide, dispersedlb.	.13	.20
Orange	.50	1	4.00	Blanc fixeton Clays:	65.00	1	120.00	Mold Lubricants Aluminum stearate, precip. lb.	.47	,.52
Du Pont	$\frac{2.75}{1.35}$	1	$\frac{3.65}{1.50}$	Championton Crownton		,	23.00	Aquarex D	.75 .32	/ .02
Stan-Tone	1.65 .30		$\frac{2.25}{1.50}$	Paragonton McNameeton	12.50	1	29.00	Carbowax compoundslbs.	.24	.35 1.15
Red Antimony trisulfide lb.	.55	1	.68	Stan-Tex Whiteton Stellar-Rton	25.00 50.00			Colite Concentrategal. DC Mold Release Fluid Emulsion No. 35lb.	2.20	/ 3.50
R. M. P. Sulfur Free lb. R.P.M. No. 3 lb.	.63 .55	1	.68 .60	Suprexton W-1291 Englishton	13.00 53.00	1	$\frac{29.50}{55.00}$	Glycerized Liquid Lubricant, concentratedgal.	1.85	20
Cadmium red lithopone lb. Cadmolith Red lb.	1.05 1.10	1	1.45 1.40	Flocks: Cotton, dark	.095 .45	1,	.112 .85	Lubrex	.25 .18 .57	.30
Du Pont	1.15	1	1.90	Dyed	.12	1	.20	Para Lube	.046	.048
Iron oxide, red	.0175 .115 .105	1	.09 .1175 .1075	X-24-W lb. Filfloc 6000 lb.	.135			Sericite	.0675 21.00	.0825 25.00
Mapico	.95	1	1.10	F-40-900	$\frac{.105}{40.00}$			Sodium stearatelb.	.19	.24
Stan-Tone lb. Toners lb. Tuscan Red lb.	1.10 .25	1	$\frac{3.05}{4.15}$	Lead sulfate, basic lb. Lithopone, comml lb.	.1575	1	.1675	Odorants Coumarin	2.75	3.30
Tuscan Red	.15 .036		.46 .049	Albalith	0.055 0.0638 0.0725	1	.0575 .0675 .075	Curodex 19	4.75 5.75	0.00
White Antimony oxidelb.	.27	7	.3275	Sunolith	$06\frac{3}{8}$ 0675	1	.0675 .0825	198	6.75 2.00	2.50
Lithopone, titanated lb, Cryptone BT lb,	.0725 $.0725$	1	.085 .0825	No. 1 Silicaton Pyrax Aton	$\frac{40.00}{12.50}$			C	2.75 .25	3.25
Titanium pigments				W. A ton Silical ton	$\frac{14.00}{7.00}$		55.00	NO. 10	4.00 5.00 3.00	4.50 5.50 4.65
Rayox LW	.175		.185 $.205$		17.00 22.00	1	27.00	Vanillin	0.00	4.0.
Ti-Cal	.0675 .175 .175		.195 .185	Terra Alba 1319 ton	20.00 27.00 .0675			Plasticizers and Softeners Akroflex C	.53	.55
B-30	.075 .0675	1	.08	Ti-Cal	.055	1	.0575 27.50	Bardex	.60	.0525
RA, RA-10lb, Zopaquelb.	.195 .175		.205 .185	Paxinosaton Witcoton	9.50 6.50	1	16.50	Bardol	.0275 .055	.0375 .0575 .51
Azo ZZZ-11 , -44, -55lb,	.11	1	$.13\frac{5}{8}$ $.12$	Finishes				Bondogen	.48 .55	.60
-66	.1325 $.12%$	1	$.1425$ $.13\frac{5}{8}$	Black-Outgal.	4.50	1	8.00	B R H No. 2	.0125 .02	.0135
Eagle AAA, lead free lb. 35% leaded lb. 50% leaded lb.	$.11$ $.12^{5}$ $.13^{3}$.1125 $.1278$ $.1358$	Flocks Cotton, dark	.095 .45	1	.112 .85	B. R. T. No. 4	.0175 $.0265$.026 .0275
Florence Green Seal-8lb, Red Seal-9	.1275	1	.13	Dyed	.12	1	.20 1.50	B. R. V. lb. Bunarax resins lb. Bunnatol G. S. lb.	.0325 .06 .40	.049 .125 .50
Horsehead XX-4, -78lh,	.1325		.135 .0975	Rubber lacquer, cleargal.	.75 1.00	1	$\frac{1.25}{2.00}$	Butvl Roleate	.11	.12
-25	.095	1	.0975	Shoe varnish gal.	2.00 1.45	1	3,50 32.00	Calcium stearate	$.45 \\ .025$.0325
Protox-166 lb. St. Joe, lead free lb. Zinc sulfide, comml lb.	.095 .11 .08	1	.0975 $.12$ $.1175$	Wax, Bees	.58 .66	1	.73 1.15	G. P	.0125 .05	.02
Cryptone ZS-800lb.	.10	1	.1025	Carnauba lb. Montan lb. No. 118, colors gal.	.45	1	.47	S Flakeslb.	.0325	.0375
Yellow Cadmium yellow lithopone lb.	.85		.90	Neutralgal. Van Waxgal.	.76 1.25	1	1.31 1.30	Contogums	.046 .0875 .0525	.051
Cadmolith Yellowlb.	.85 .295	1	.90 .315	Latex Compounding Ingredi	ients			MH	.065 .0975	.1175 .1275
Du Pont	1.35 .09 .0825	1	1.95 .0925 .085	#6, #7, #8lb.	.55 .15	1	.60	Dibenzyl phthalatelb. Sebacatelb. Dibutyl phthalatelb.	.51 .67	.59
Ocher, yellow lb. Stan-Tone lb.	1.00	4	.0475 1.55	A-2, -155 lb. A-40, -41 lb. A-155 TH lb. Accelerator 89 lb.	.165	1	.18 .195 .19	Sebacate	.36 .7775 .25	.40 .7925 .30
Toners	.50 1.25		1.37 1.35	122	1.20 1.30	1	.13	Dielex B lb. Diethyl phthalate lb.	.06 .315	.385
Dispersing Agents				Advawet 10	.46 .35			Dimethyl phthalatelb. Dipentene 122	.235	.305
Darvan Nos. 1, 2	.19 .1225	1	.30 .2587	Amberex Solutionslb.	.60 .1675	1	2.25	Dipolymer Oil gal. Dispersing Oil No. 10 lb. Duraplex C-50 LV, 100% lb. Dutrex 6 lb.	.33 .0525	.38
Triton R-100lb. Dusting Agents	.12	1	.25	Antox, dispersed lb. Aquarex BBX, Conc lb.	.54 .78			Duraplex C-50 LV, 100% .lb, Dutrex 6	.25 .025	.0375
Glycerized Liquid Lubricant				D	.76 .30 .92			Emery's 0-18 Elaine lb. S-24 lb. Flexol Plasticizer 3GH lb.	.255 .34 .55	.3275 .43 .60
concentrated gal. Lubrex lb. Mica lb.	1.85 .25 .0675	1	.30 .0825	NS lb. SMO lb. Areskap 50 lb.	.60 .50			3GO	.515	.60
Pyrax A ton	12.50 14.50		.0020	100, dry	.30 .60	1	.38 .72	8N8	.395	.465 .424
W. A. ton Snow Crest Talc ton Vanire gal.	33.00 2.00	1 3	35.00 2.50	Aresket 240	.30 .60	1	.38 .72	Galex W-100	.135	.52 .1725
Zinc stearatelb.	.48	1	.49	400, dry	.42 .70 .22	1	.57 .84	W-100D. th. G. B. Light Process Oil th. Heavy Resin Oil th.	.1325 .025 .015	.17 .0325 .0225
Extenders Advagum 1098	.42			Casein	.29 .85	1	.37	Hercolyn lb. Indonex val.	.1122	1347
1198	.40	1	.026	CW-12 10 CW-37 1b, Darex Copolymers Nos. 3-L, 9-L, X34-L, X44-L 1b, Dispersed Sulfur No. 2 1b	.70	,	EQ.	IMH. lb. lb. Lead oleate lb.	.65 .2625	.68
B. R. T. No. 7	.0265 .025 .0125	1	.0275 $.0325$ $.02$	9-L, X34-L, X44-L lb. Dispersed Sulfur No. 2 lb. Ethyl Thiurad lb.	.365 .10 1.25	1	.50 .12	Nevillac oils	.33	.50
			100	many t amanage				Resinslb.	.31	.45

Neville 465 Resin lb. R Resins lb.	\$0.0575 .10	\$0.155	Reinforcers, Other Than C	Carbon Blac	k	Hycar Latex (dry wt.) 1501, 1531, 1551lb.
Nevinollb.	.17	.025	B. R. C. Nos. 18, 19E, 20, 22	\$0.0125	\$0.0135	1502, 1552, 1562
Nevoll	.0775	.08	Bunarex resins lb. Calcene T. ton Calco S. A. lb. Carbonex, flakes lb.	.06 40.00	.125 50.00	Neoprene Latex (dry wt.)
No. 1-D heavy oil the	.055		Calco S. A	.75 .0325	.0375	572, 700
Para Flux regular gul	1895	.2025	3 Flakes	.13.24.12	.0525	Neoprene Type AC, CG lb.
No. 2016 gdl. Para Resins 2457, 2718 lb. Paradene Nos. 1, 2 lb.	.04	.045	Plasticlb.		.051	Neoprene Lates (dry wt.) Type 571, 842, 842-A lb. 572, 700 lb. 601, 601-A lb. Neoprene Type AC, CG lb. E. M lb. FR, KNR lb. NC lb.
Paradene Nos. 1, 2 lb.	.065	.010	Aluminum Flake ton	16.00 / 20.00	22.00	NC lb. Paraplex X-100
No. 35	075		No. 5 lon Barden ton	12.00 /		
Para Lube b.	.046	.048	Bucaton Catalpoton	30.00		26
G-25, 100°c	.21 .75 .0975		Chinaton	9.50	16.00	Perbunan Latex Type H
Paroils. 1b. Pepton 22 1b. Picco-10, -25 1b.	.72	.18 .75	Dixie	28.00 17.00		Silastic No. 121
	.110	.17	L. G. B	12.50 /	29.00	(55%)
480 Oilproof resin /b.	.15	,20	Suprex ton Witco Nos. 1, 2 ton	13.00 /	29.50	125
S. O. S	.055	.06 .275	Witco Nos. 1, 2ton Cumar EXlb,	25.00 .0525		126
Piccolyte Resins !h. Piccoumaron Resin 427-R !b.	.15	.2075	MH	.065	.1175	181
Resins	.12	.17	V	.395	.42	Tackifiers
Piccoval Di	.0975	.1675	No. X 34	.08		Bunarex-10, 25, -40lb.
Pictar. gal. Plasticizer 35 lb. 36 lb.	.25 .205	/ .30	Magnesia, Calcined		.455	Contogums
36	.305	.34	Extra Light, U.S.Plb. K&M	.08	.33	Hercolynlb.
1889	.34	.40	K&M	.28 .175		Hercolyn lb. Natac lb. Nevillac lb,
1889	.68 .35	.45	No. 101	.05	.1275	Nevillac lb. Nevilloid C-55 lb.
Plastoflex No. 10	.50	.57	Medium light, technical lb. Magnesium carbonatelb.	.12	.125	Nevindene lb. Picco-10, -25 lb. Piccolastic Tackifiers lb.
No. 211	25		Marbon S, S-1	.36	.43 .75	Piccolastic Tackiners lb. Piccolyte Resins lb.
Plastogen	.0775	/ .30	Type B	25.00		Piccolyte Resins
PS-60 Resin lb. PT67 Light Pine Oil gal. 101 Comml. Pine Tar	.35	.70	Multirex ton Neville R Resins the	.10	.155	Staybelite Resin lh. Synthetic 100 lb.
101 Comml. Pine Tar Oil. gal.	.345	.455		.04	.045	Synthetic 100
400 Light Ding Tow gal	.345	.455	Picco-75, -100	.139	.275 .2075	Synthol lb, Vistac No. 1 gal, No. 2 gal, 4 gal,
600 Med. Pine Tar. gal. 800 Heavy Pine Tar gal.	.345	.455 .455	Piccommaron Resins	.06	.17	4gal. Vistanexlb.
	.1075	.12	Plicovars	.0975 /	.1675 .82	Vulcanizing Agents
Reogen lb. Resin C pitch lb. R6-3 lb. Resinex lb.	.02	.0285	Piccovarslb. Pliolite, Natural Rubberlb. Milledlb. S-2, Milledlb.	.85	.92 .81	Dibenzo G-M-Flb.
Resinex	.0325	.0375	S-3, -6	.36 /	.43 .50	Ethyl Tuadslb.
RPA No. 2	.0225 .65	.03	PS-60 Resin	.35	.0285	G-M-F
L-4.	.46		Resinex	.0325	.0375	Eagle, sublimed lb. Magnesia, Calcined
RSN Flux gal. Rubberol Compound lb.	.10 .315	/ .19	S-Polymers	.055	.06	Carey
5- Polymers	.44		Super Multifexton Witcarb Rton	145.00 100.00		Carey
F-15	.52	.57	R-12ton	32.50	1057	Light, technical
M-17	.46 .3225	.51	Zinc oxide, commercial†lb.	.11	.1358	No. 101
Sepacic acid	.48 .56	.55	Retarders			Methyl Selenac
Staybelite Resin 1h	.06	.065	Cumar RH	.105 .55	.60	Red lead, commerciallb.
Stearic acid, single pressed lb.	.305	/ .153%	E-S-E-N	.34	.39	Eagle
Triple pressed	.31	.32	Cumar RH	.27	.33	Crystex
Stearite	.1478		R-17 Resin	.1075	.11	Insoluble 60 lb. Monochloride lb. Rubbermakers 100 lbs.
TR-11	.035	/ 0=5	Wlb.	.36 .43		Teller: Ih.
Turgum 5	.095	.375	Retardex	$\frac{.475}{1.25}$		Vandex lh. Vultac Nos. 1, 2 lb. No. 3 lb. White lead silicate lb.
Vistae No. 1gal.	.215 1.21	1.32	Thionex	1.25 1.25		No. 3
2gal.	1.62 1.76	1.66 1.80	Vultrol	.50 /	.55	White lead silicatelb. Eaglelb.
X-1 Resinous Oil	.025	1.00	Solvents			
XX-100 Resin	.0525	/ .46	Benzol, industrialgal.	.21 /	.29	
Reclaiming Oils			Bondogen	.55	.60 .0875	
			Tetrachloridelb.	.07	.095	
Bardes	.05 .0275	.0525	Cosol No. 1gal.	.30 /	.38	
B. R. H. No. 2 lb. B. R. T. No. 3 lb.	.055 .02	.0575	GVL	1.00	.25	Califlux R-100
	.024	/ .025 / .0235	Nevsol gal. Picco Hi-Solv Solvents gal. Skellysolve-B gal.	.21	.26	Califlux R-100, a sulfur-re-
	.0325	.049	Cgal.	.133		tackifier for natural, GR-S, bers, is a reddish-brown lie
BWH-1 lb. Dipentene 122 gal. Dipolymer Oil gal. Dispersing Oil No. 10 lb.	.60	/ .75	Toliac gal. Toluol, industrial gal. 2-50-W Hi-Flash Solvent gal.	.195	.25	mixture of naphthenic hyd
Dispersing Oil No. 10 lb.	.33	.38	2-50-W Hi-Flash Solvent gal.	.28	.37	antly unsaturated. It is similalso made by Golden Bear Oi
G. B. Reclaiming Oil gal. Heavy Resin Oil lb.	.12	.0325	X-60 Solvent	.24 /	.32	but has a higher molecular and an activating effect on
2.3-83	.15	.23				flatter cures, higher tensile modulus than Califlux G.P.
No. 1 Heavy Col lb.	.055		Synthetic Resins	.33 /	50	Califlux R-100 is identical Nattolen R-100. It has a spe
-572 gal. No. 1 Heavy [ri] lb. No. 1621 lb. Picco C-10 cal. C-28	.025 .25	.035	Marvinel VR-10lb.	.33	.50	1 04: initial boiling point of
C-28 gal C-33 gal C-42 gal	.33	.38	Synthetic Rubbers and La			at 25° C., and 40-150 cp. at
	.27	.32	Butaprene NAA	20 /	.465 .415	10 mm, pressure; viscosity at 25° C., and 40.150 cp. at aniline point below 40° C. T in most organic solvents, h
E-5. gal. O Oil gal. PT 101 Comml. Pine Tar	.21 .246	.26	NL NXM	.40	.425 .495	bility and a mineral oil odor good swelling agent for unv
PT 101 Comml, Pine Tar Oil gal.	.345	.455	Butaprene Latex (dry wt.)	,455 /	.49	use is advantageous in natur
150 Solventene gal	.44	.55	NL	.53	.60	where its activating and t most pronounced. The mat for the hydrocarbon base of
Solvenol	.56 .015	.58	Chemigum Latex Type 101 (dry wt.)	.37	.40	and, if used in amounts of
A-50 Solventgal.	.26 .24	.30	-20, -20 EP, US-10(h.	.40	.53 .435	per 100 parts RHC, required and filler to retain hardne
X-443gal.	.20	/ .27	-25 NSlb.	.42	.455	properties.

reactive plasticizer and S. and reclaimed rub-liquid consisting of a drocarbons, predomin-milar to Califux G.P., Oii Co., Olidale, Calif., ar weight and viscosity on cure. It also gives le strength, and lower by the constraint of the constraint of the strength, and lower of the constraint of the constraint of the strength, and lower of the constraint of the constraint of the strength, and lower of the constraint of the c

\$0.48 .41 .425

.29 .30 .32 .50 .65 .75 .35 1.00 .39 .40

.38 2.35 3.20 3.60 3.80 4.00 3.35 2.90 3.55

.07 .0875 .135 .1325 .1122 .105 .23 .12 .125 .12 .139 .15 .106 .06 .41 .255 1.21 .162 1.72

2.65 1.00 2.50 .1925 .2025

.28 .31 .05 .28 .22 .175 .175 .1.60 .2025 .2125 .1.90 .195 .0325 .13 .0325 .13 .0325 .13 .0325 .13 .0325 .14 .0325 .2125 .13 .0325 .2125 .

\$0.53 .46 .475 .37 .38 .40

.425 .435 .505

 $\begin{array}{c} .42 \\ 2.75 \\ 3.60 \\ 4.00 \\ 4.40 \\ 4.40 \\ 3.95 \\ 3.50 \\ \end{array}$

4.15

.125 .11 .1725 .17 .1347 .115 .25

.155 .17 .275 .2075 .17 .17 .065

1.32 1.66 1.80 .36

.33 .28

.2175

 $\substack{2.85 \\ .23 \\ .0825 \\ .135 \\ .0825 \\ 2.00 }$

.45 .49 .2275 .2275

modulus than Califux G.P.
Califux R-100 is identical in composition with Naftolen R-100. It has a specific gravity of 1.01-1.04; initial boiling point of 100 °C, minimum at 10 mm, pressure: viscosity of 20,000-200,000 cp. at 25° C., and 40 150 cp. at 90° C.; and a mixed amiline point below 40° C. The product is soluble in most organic solvents, has good storage stability and a mineral oil odor. Califlux R-100 is a good swelling agent for unvulcanized stocks. It use is advantageous in natural rubber compounds where its activating and tackifying effects are most pronounced. The material is an extender for the hydrocarbon base of rubber compounds and, if used in amounts of eight or more parts per 100 parts RHC, requires adding more sulfur and filler to retain hardness and stress-strain properties.



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Akron 8, Ohio

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"BRAKE LININGS"

A comprehensive eyelopedia of the history and construction of brake linings of all types—how to select materials and avoid failures and troubles—based on actual experience and extensive research and presented in simple and comprehensive language, 91 pages, 83½ x 11 inches, indexed.

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Sheet & Rod Packings for every condition

Mechanical Specialties of Every Description

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LONDON: 107 Clifton St., Finsbury

CHICAGO: 168 North Clinton St.

NEW YORK: 80-82 Reads St.

June, 1948

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RLD

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory—March and February, 1948: First Quarter 1948-47

1947
First Three
Months 4,902,774 13,112,476 353,765 18,369,015
20,290,956 3,517,502
1,613,987 2,410,074 357,384 4,381,445 4,709,537 998,000
6,516,761 15,522,550 711,149 22,750,460 25,000,493 4,515,502
6,510,576 12,814,421 617,882 19,942,879 24,481,266

Note: Cumulative data on this report include adjustments made in prior months. Source: The Rubber Manufacturers Association, Inc.

Rims Appraisal and Branded by The Tire & Rim Association, Inc.

RIM SIZE	April, 1948		April, 19
5" & 16" D. C. Passenger		Flat Base Truck (Cont'd)	
5x3.50D	2,286	20x8.0	3,3
5x4.00E.	25.451	24x8.0	
6x4.00E		19x8.37 V	€.
5x4.50E		20x8.37V	. 6
6x4.50E		20x8.37V 24x8.37V	1.5
5x5.00E		19x9.00V	
6×5 00P	56,989	20x9.00V	
6x5.00F 5x5.50F	58,633	24x9.00\	
C. E EAD	2,493	20x10.0	
6x5.50F		20210.0	1,0
5x4.00E—Hump	33,029	Semi D. C. Truck	
Sx4.50E—Hump			
5x5,00F—Hump		15x5.50F	36,2
x412-K.	38,962	16x5.50F	16.4
5x412-K	69,919	20x5.50F	4.3
x5-K	276,934		-,0
3x5-K	90.187	Tractor & Implement	
x512-K	101,573		
x6-Ĺ		12x2.50C	
x6-L		12x3.00D	
x61 ₂ -L		15x3.00D	
ix6 Ly-L		18x3.00D	
x412-K—Hump		19x3.00D.	5.0
x5-K—Hump		21x3.00D.	6.9
X3-K—Hullip	90.612	24x3.00D	8
x51a-K—Hump x6-L—Hump	12.747	36x3.00D	
xo-L—Hump	12,646	16x4.25KA	5,0
		20x4.50E	
at Base Truck		36x4.50E	
x4.33R	1.998	18x5.50F	9.7
		20x5.50F	6.8
x5.0			
x5.0	9,940	24x5.50R	4.7
0x5.0	21.059	40x5.50R	2
x5.00S		24x6.00S	9
x5.5	24,082	24x8.00T	
x5.50S		28x8.00T	
x5,50S .	9,471	40x8.00T	
x6.0	1.158	W6-24	
x6.0. x6.00S.	213.830	W8-24	22,4
x6,00S.	78,088	W8-32	
ND.UU I	11.5	W8-36	
x6.00T	264	W8-40,	2
x6,5	160	W9-24	
x6.5	21.997	W9-28	21.0
x6.50T	1.023	W9-38	7.3
x6,50Tx6.50T	4.827	W10-28	
x7.0	196	W10-36	
x7.0		W10-38	
x7.0		W10-40	
x7.00T	12,975	W11-26	
	376		
x7.33 V x7.33 V x7.33 V	370		3
x7.33 V	7.344	DW9-38	
		DW10-26	3
x7.5 .	671	DW10-38	12,1
x7.5	8.201	DW10-42	- 8
2x7.5	8,786	DW11-24	
x7.50\	7.008	DW11-26	7
x7.50\	4.130	DW11-28	3.9

RIM SIZE	April, 1948
Tractor & Implement (Cont'd)	
DW11-38 DW12-26 DW12-30 DW12-34 DW16-26	2,977 3,961 4,696
Earth Mover	
20x11.25 24x13.00 32x13.00 24x15.00 25x15.00 25x17.00	. 14 . 316 . 12
33x22.00	
Total	2,957,740

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, or through its field offices, for \$1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

Dr. Joseph Hasek, representing Hasek Trading Co. and Hasek Bankers, P. O. Box 81, rague, Czechosłovakia; truck tires, chemicals. D. P. Loretto, Rua Mexico 164, 40 andar, Sala 2, Rio de Janeiro, Brazil; automobile parts and

42, Rio de Janeiro, Brazil: automobile part's and accessories. 6 mandit Sirketi, Agopyan Han, Galata, Istanbul, Turkey: wire and cable. Maney & Co., Post Office Box No. 384 Shapur House, Cawasji Patel St., Fort, Bombay, India: testing equipment including that for the rubber industry.

S. I. M. A. N. Società Importazioni America Nord, 4 Piazza della Repubblica, Florence, Italy: X-ray accessories, deutal materials and supplies. Instrumentenhandel A. Hofelt, 73 L'aguer-estraat, The Hague, Netherlands: app aratus for testing plastics on hardness and other characteristics.

restraat, The Hague, Netherlands: apparatus for testing plastics on hardness and other characteristics.

Theo Wachtel, 45 Van Soutelandelaan, The Hague, Netherlands: men's raincoats.

Larderello Società Anonima, 2 Piazza Strozzi, Florence, Italy: truck tires and tubes, insulating materials.

Societa Commerciale Macchine—S. C. M., 9 Via Gazzani, Siena, Italy: tires and inner tubes. Oscar Garza Garcia, Espinosa 134 Pte., representing Casa Garza Lozano, A. A., and Alumbrado y Novedades, S. A., both, Calle de 5 de Mayo #536 Ote., Apartado #205 all of Monterrey, Neuvo Leon, Mexico: sporting goods.

Beattie Shipping Co., Estrada Palma 24, Manzanillo, Oriente Province, Cuba: automobile and truck tires.

Handelsonderneming Koha, 44-58 Aelbrechtskade, Rotterdam, Netherlands: surgical and hospital rubber goods and plastic surgical bandages, Leitão & Cia., 74-8/92-8 Ruy Barnosa, Teresina, Piaui, Brazil: automobile parts and accessories, electrical supplies.

International Chemical Co., Ltd., 2 Via Calimala, Florence, Italy: industrial shemicals, including varnishes, resin, waxes, colors, carbon black, and lampblack.

Società Anonima Medici Export Import, 11 Via dei Pucci, Florence, Italy: pneumatic tires, natural and crepe rubber.

Alfred Salvisberg "Laines, Cuirs & Peaux," Boite Postale No. 179, Mazamet (Tarn), France: plastic materials for the manufacture of handbags, belts, and watch bands.

Import Opportunities

Antonio Cressi, 38n., Corso Torino, Genea, Italy: complete equipment for underwater fishing. Imextrade (London), Ltd., 42 Theobalds Rd., London, W. C. 1. England: rubber goods. Felix Dansard, Impasse du Pilat, St-Chamond, Loire, France: elastic telephone-receiver cords. Peradin, Ltd., Freshford Mill, Freshford, Somerset, England: scented rubber floor covering.

Somerset, England: scenteu rubber ing.
Manufacture Générale de Caoutehouc, C. Jenatzy-Leleux, S. A., 16 Rue de la Scierie. Sclessin (Liege), Belgium: bicycle tires, tubes, and accessories, molded and manufactured articles such as tubes, mats, washers, and sanitary goods, and rubber articles for shoes.
S. A. Establissements J. Laroche-Lechat, 16 Quai Peynaert, Ghent, Belguim: industrial rubber belting.

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Effective July 1, 1947

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Allow nine words for keyed address.

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Replies forwarded without charge

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

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CONSULTING WORK: CHEMISTRY PHYSICS, ENGINEERING, organization, by an experienced CONSULTING ENGINEER. Address Box No. 116, care of INDIA RUBBER WORLD.

MANUFACTURERS' AGENT—SALESMAN—SALES MANAGER—18 years' complete Mechanical Rubber Sales experience. Large, lucrative, most desirable Industrial and Jobber following. Salary, drawing account, or commission to average \$6,000,00 upwards. Age 39; college; single. Address Box No. 117, care of 1801a RUBBER WORLD.

CHEMIST, 20 YEARS EXPERIENCE, 7 YEARS SUPERVISORY. Rubber and plastic compounding, molding, and extruding. Desires position as department head or plant superintendent. Eastern location. Address Box No. 118, care of India RUBBER WORLD.

LATEX TECHNOLOGIST SEEKS POSITION AS ASSISTANT TO Works Manager or to chief chemist or as general foreman, 18 years' experience in Latex formulation, compounding, production of goods, Reclaimed Dispersions, Colloids in general, Laboratory and shop, Office routine, Excellent references. Single, Location, West Coast preferred, Address Box No. 126, care of India RUBBER WORLD.

COMPOUNLER AND PRODUCTION SUPERVISOR. THOROUGH knowledge natural and synthetic latices, blown sponge, vinyls, dyes and colors. Ten years' experience calendering, coating, press and heat curing, printing. Thirty-five; married. Available reasonable notice. Address Box No. 129, care of India RUBBER WORLD.

RUBBER AND SYNTHETICS TECHNOLOGIST, 19 YEARS chief chemist in charge of development and quality control in lab, and plant. Diversified products include general proofed goods, offset and newspaper press blankets, rollers, flotation equipment coatings, vinyls, diaphragms, synthetic shoe soling, oil-resistant industrial fabrics. Address Box No. 131, care of India RUBBER WORLD.

CHIEF CHEMIST, NOW EMPLOYED, DESIRES POSITION AS assistant to technical director or sales engineer with reliable firm. Prefer New York location. 17 years' experience in compound development and production of calendered, coated, and combined fabrics, utilizing pyroxylin, latex, vinyls, synthetic, and natural rubber. Energetic and capable of handling laboratory and production problems. Address Box No. 132, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

SPONGE RUBBER EXPERT, MUST BE FULLY VERSED IN ALL phases of Sponge Molding State age, experience, and salary requirement in first letter. Address Box No. 119 care of India RUBBER WORLD.

WANTED: PLANT ENGINEER, SUCCESSFUL MEDIUM-SIZED rubber factory has excellent opening, plant engineer capable supervising steam power plant, all maintenance, and new installations, etc. Granuate engineer preferred. Address Box No. 120, care of INDIA RUBBER WORLD.

We have an opening for a man to take complete charge of small rubber plant. Must be entirely familiar with all the operations from Mill Room to finishing operation. Exceptional opportunity for right party. Write in detail past experiences and salary expected. All replies will be kept in strict confidence.

Address Box No. 128, care of India RUBBER WORLD.

PLANT MANAGER

Experienced man who can take full charge of operation, compounding, and development of a large rubber canvas footwear plant in the Orient. State qualifications, experience, salary, etc. Address Box No. 101, care of India RUBBER WORLD.

Eastern Reclaimer desires

TECHNICIAN and REPRESENTATIVE FOR CUSTOMER SERVICING

State experience, Technical Training, previous employment, education and background, salary expected. Strictly confidential.

Our personnel know of this advertisement.

Adress

Box No. 115, Care of INDIA RUBBER WORLD

SALESMEN TO CALL ON RUBBER MANUFACTURERS IN Eastern United States to sell Black Masterbatch for popular priced products, mats, etc. Address Box No. 124, care of India RUBBER WORLD.

RUBBER TECHNOLOGIST BETWEEN 25-35 YEARS OF AGE, with organic chemical background, for development work on molded rubber products. Proposed development will eventually involve application of all types of commercially available elastomers. Send full details in confidence to Johns-Manville Research Center, John-Manville Corporation, Manville, New Jersey. Att: Personnel Section.

SALES MANAGER WANTED—MAN EXPERIENCED SELLING molded rubber products. Address Box No. 133, care of India RUBBER WORLD.

TIRE DEVELOPMENT ENGINEER. MAJOR TIRE COMPANY has unusual opening for experienced tire development engineer. Work will be on passenger and truck tires, writing specifications and following them through entire manufacturing process. Graduate from recognized technical college important. In first letter cover fully training and background. Address Box No. 134, care of India RUBBER WORLD.

WANTED: CAPABLE MILL ROOM FOREMAN FOR A PLANT in the South. Give full particulars about experience, salary expected, etc., in first letter. Address Box No. 138, care of India RUBBER WORLD.

WANTED: SPECIALIST OF RUBBER TOYS AND MECHANICals for a plant located in New England. Give full particulars about experience, salary expected, etc., in first letter. Address Box No. 139, care of Ispia RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

RUBBER MILL 36" TO 40", GOOD CONDITION, WITH MOTOR, Give full particulars, price, location. Address Box No. 123, care of INDIA RUBBER WORLD.

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FOR SALE: SPONGE RUBBER PLANT IN NORTHERN OHIO Completely equipped and in operation. Partners disagree, Address Box Completely equipped and in operation. I No. 121, are of India RUBBER WORLD.

MANUFACTURERS' AGENT FOR NEW ENGLAND DESIRES new line or lines for rubber manufacturers. Top-flight quality representation. Excellent connections, Chemists, Technical Superintendents, and Purchasing Agents. Membership in Boston, Rhode Island, and Connecticut Rubber Groups. Address Box No. 130, care of INDIA RUBBER WORLD.

WANTED - Large engineering firm wishes to acquire several complete Rubber plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment, whole or in part. Personnel retained where possible, strictest confidence. Box 1220, 1474 Broadway, New York 18, N. Y.

(Classified Advertisements Continued on Page 453)

 $3,133 \\ 2,977 \\ 3,961$

1, 1948

957,740

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Peaux," France: hand-Genoa, fishing, ds Rd.,

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ne, C. Scierie, tubes, red ar-d sanihat, 16 al rub-

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Malayan Rubber Statistics

The following statistics for March, 1948, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W. C. 2, England.

Ocean Shipments from Singapore and Malayan Union-In Tons

	Shee	and Crepe		Revertex (Dr		
	0:	Malayan	Union	6:	Malayan	Union
To	Singapore — Export Proper	Trans- shipped	Direct Shipment	Singapore Export Proper	Trans- shipped	Direct- Shipments
Australia. Belgium	857	219	316 612	13	38	4
Canada	872	142	1.720			3
Chile			335	111		
China	1,493					
Cyprus	1					
Czechoslovakia	438					
Denmark	25	25	113		3	
Egypt	8			1		
Finland	17.5		305	17		
France	1.217	145	1.292	28	58	188
Germany	3,358	347	2,563	112	28	
Greece		5				
Hong Kong	1.364	2	279			
Italy	742	68	2.046	19		21
Mexico	65		500	4.0.1		
Netherlands	905	220	752	9	14	9
New Zealand			5			
Norway	190	5	82	16	8	
Other countries in Africa	50					
North America	1					
South America			163			
Poland	420					
Portugal	28			1		
Russia	3.700					
Sumatra			2			
Sweden	806	6	1,265	5	18	2
Switzerland	189					
Turkey	85	10	70	* * *		
Union of South Africa	690	90	310	1	4	
United Kingdom	4.855	1,692	9,063	398	45	110
U. S. A	12,574	955	7,307	1,300	8	1,423
TOTAL	35,108	3.841	29,000	1.920	224	1.760

Foreign Imports of Rubber in Long Tons

Singapore Imports from	Dry Rubber	Wet Rubber (Dry Weight)
Banka and Billiton	47	8
Brunei	126	3
Dutch Borneo	1.673	523
French Indo-China	55	
Java	483	
North Borneo	829	40
Other British countries		
in Africa	*	8
Other Dutch Islands	88	5
Rhio Residency	627	6
Sarawak	2,646	* * *
Other countries in Asia	19	3
	7,838	5.590
Sumatra	1,000	3,390
TOTAL	15,466	6,186
Federation of Malaya Imp		
Burma	597	82
Siam	567	82
Sumatra	863	915
TOTAL	2,027	1.079
Dealers Stocks		Tons
Up Country		. 36,598
Penang & Province Wellesley	7	. 16,411
TOTAL		. 53,009
Port Stocks in Private Lie	ghters	
and Railway Godowns		
Penang & Province Wellesley	7	. 6.810
Port Dickson		
Port Swettenham		
Singapore		
Teluk Anson		. 388
TOTAL		19.831
Production		. 10,001
		04.000
Estates		
Small holdings (est.)		. 26,549
TOTAL		. 58,437

Pyroxylin-Coated Fabrics and Paper

The following are the figures for pyroxylin-coated fabrics and paper for the first quarter of 1948, as reported by the Burean of the Census, United States Department of Commerce. The statistics based on recorts from 25 companies during February and March and 25 companies during January, represent the operations of processors who coat or impregnate fabrics or paper with soluble cotton or pyroxylin preparations, either separately or in combination with other materials. "Light" cotton fabrics include sheetings and print cloths: "heavy" cotton fabrics include drills, ducks, sateens, broken twills, and moleskins. All figures are given in linear yards, except for pyroxylin spread and monthly capacity, both of which are given in pounds.

	January	February	March
Total (except non-fabric materials):*			
Shipments	6.186.113	6.462.469	5.687.229
Unfilled orderst	6,656,388	5.732.735	5.227.651
Light cotton fabrics:			
Shipments	2.908.088	3.313.910	2.957.942
Unfilled orderst	3.049.020	2.572.605	2.122.392
Heavy cotton fabrics:	0.040,040	2,012,000	
Shipments	2.067.437	2.025,970	1.762.789
Unfilled orders†	2,686,730	2.433.180	2.340.122
Custom coating:	2,000,100	-,400,100	-,010,1
Shipments	1.210.588	1.122.589	966,498
Unfilled orderst	920,638	726,950	765,137
Non-fabric materials:			
Shipments	156,223	159,032	143,763
Unfilled orderst	184,080	154,658	144,513
Pyroxylin actually spread, lbs	4,935,997	4.958,190	4,327,979
Monthly capacity §, lbs	16,790,347	16 790,347	16,790,347
And the same of th			

*Data include an undetermined quantity of custom coating of non-fabric materials.
*Orders on hand at the close of the month, exclusive of contracts, with shipping

Toracts on name at the close that the date supporting the form of the control of

Stainless Steel Pump

(Continued from page 430)



Jabsco Pump for Rubber and Chemical Applications

lar interest for portable units and for intermittent transfer of active chemical solutions since it eliminates the need of sumps or manual priming. The liquid being pumped provides automatic lubrication between the impeller and pump body. The pump masse lubrication between the impeller and pump body. The pump can be operated in either direction and mounted in any position without any change in efficiency. Positive mechanical sealing is provided, and bearings are sealed and protected by ample drain holes and slinger ring. A wide range of satisfactory operating speeds, from 100 to 1.750 r.p.m., offers a maximum of flexibility in driving arrangements. The pump is available at present with provision for 1½-inch pipe connections only, but larger and problem into a scheduled for method described developments. smaller sizes are scheduled for early development.

"2-MT Acceleration for Heat-Resisting Rubber Inner Tube Compounds." B1-224, April 30, 1948. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 4 pages. Test data show that heat-resisting inner tube compounds utilizing Thionex-activated 2-MT are fast curing and have unusually good retention of physical properties after they have been aged at elevated temperatures.

"Ethocel Hotmelts for Paper Coating." Dow Chemical Co., Midland, Mich. 16 pages. This technical service bulletin on Ethocel Hotmelts describes the effect of the various constituents. preparation and application of the Hotmelts, and properties obtainable. Tables of formulations are included.



Rubber Weight)

523

40

590

186

115

Tons

53,009

6,810

3,340 9,275 388

19.831

58,437

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One Used 104" Nagle Tread Tuber, double reduction cut spur gears, base extended for 100 H.P. 900 R.P.M. motor. 1st grade rebuilt.

One Late. Little used 20" and 48½" by 88" Farrel-Birmingham Horizontal Asbestos Sheeter complete.

One 110 G.P.M. 2,000-pound pressure Baldwin Southwark Vertical Triplex Pump 3½" by 14" single herringbone gears, with 150 H.P. 514 R.P.M. 440-volt slip ring motor and control—late model. Little used, rebuilt. Includes suction valve control.

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June, 1948

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Cabot, Godfrey L., Inc. Front Cover Calco Chemical Division, American Cyanamid Co., 415 Cambridge Instrument Co., Inc	General Atlas Carbon Co. General Chemical Evision, Allied Chemical & Dye Corp. General Electric Co. (Chemical Dept.) General Latex & Chemical Corp. General Magnesite & Magnesia Co. General Tire & Rubber Co., The Genseke Brothers Gidley, Philip Tucker Giffels & Vallet, Inc. Goodrich, B. F., Chemical	334 339 340 332 435 449 351 438 333	Co. National Sherardizing & Machine Co. The National-Standard Co Naugatuck Chemical, Division of U.S. Rubber Co Neville Co., The Neville Co., The Pennsylvania Industrial Chemical Corp Pequanoc Rubber Co Pequanoc Rubber Co	454 314 309 322	United Engineering & Foundry Co. United Rubber Machinery Exchange U. S. Rubber Reclaiming Co., Inc. V Vanderbilt, R. T., Co., Inc.	343 453 319 356
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